Washoe Creek

Timber Sale
Environmental Assessment

January 2011
Montana Department of Natural Resources and Conservation
Southwestern Land Office
Missoula Unit

FINDING
WASHOE CREEK TIMBER SALE

An interdisciplinary team (ID Team) has completed the Environmental Assessment (EA) for the Washoe Creek Timber Sale prepared by the Montana Department of Natural Resources and Conservation (DNRC). After review of the EA, project file, public correspondence, Department Administrative Rules, policies, and the State Forest Land Management Plan (SFLMP), I have made the following decisions:

1. ALTERNATIVE SELECTED

Two alternatives were presented and the effects of each alternative were fully analyzed in the EA:

1. The No Action Alternative
2. The Action Alternative

The Action Alternative proposes to harvest approximately 2-3 million board feet (MMBF) of timber on 345 acres. The No Action Alternative does not include the harvest of any timber. Subsequent review determined that the alternatives, as presented, constituted a reasonable range of potential activities.

For the following reasons, I have selected the Action Alternative without additional modifications:

a) The Action Alternative meets the Project Need and the specific Objectives of the Proposed Action (Desired Outcomes and Conditions) as described on pages 1-1 and 1-2 of the EA. The Action Alternative would produce an estimated $350,000-$525,000 ($175/MBF) return to the Common School (CS) Trust, while providing a mechanism whereby the existing timber stands would be moved towards conditions more like those which existed historically.

b) The analysis of identified issues did not disclose any reason compelling the DNRC to not implement the timber sale.

c) The Action Alternative includes mitigation activities to address environmental concerns identified during both the Public Scoping phase and the project analysis.

2. SIGNIFICANCE OF IMPACTS

For the following reasons, I find that the Action Alternative will not have significant impacts on the human environment:

a) **Water Quality –** There would be a low risk of direct or indirect impacts to water quality or downslope beneficial uses within the watershed. There is very low risk of cumulative impacts to water quality or beneficial uses from increases in water yield or sediment delivery. Water Quality Best Management Practices for Montana Forests (BMPs) and the Streamside Management Zone (SMZ) law will be strictly adhered to during all operations involved with the implementation of the Action Alternative.

b) **Cumulative Watershed Effects –** Estimated increases in annual water yield for the proposed action has been determined to be negligible by the DNRC Hydrologist. Increases in sediment yield are expected to be negligible due to the amount of area treated, location along the landscape, replacement and/or improvement of existing culverts and mitigations designed to minimize erosion.

c) **Geology/Soil Resources –** With the implementation of BMPs and the recommended mitigation measures, the proposed harvest operations present a low risk of detrimental impacts to soils. Existing roads would be improved to meet BMPs. Leaving 5 – 15 tons of large, woody debris on site will provide for long-term soil productivity. Harvest mitigation measures such as skid trail planning and season of use limitations will limit the potential for severe soil impacts

d) **Cold Water Fisheries –** Implementation of the SMZ law and Rules, Best Management Practices and site-specific recommendations of the DNRC Soil Scientist and Hydrologists would minimize impacts to downstream perennial stream channels. Replacement of the two restrictive culverts on Union Creek will directly improve connectivity on 1.25 miles of Union Creek and indirectly improve connectivity from the crossing in Section 11 T12N, R15W and downstream for several miles.

e) **Noxious Weeds –** Equipment will be cleaned prior to entering the project area, which will reduce the likelihood of weed seeds being introduced onto treated areas. The DNRC will monitor the project area for two years after harvest and will use an Integrated Weed Management strategy to control wee infestations should they occur.

f) **Forest Conditions and Forest Health –** Implementation of the Action Alternative would reduce stocking levels, reduce the likelihood of new Mountain Pine Beetle infestations and attempt to salvage those trees which have been lost to beetle attack within treated stands. The remaining stands would likely emulate those conditions which existed prior to European settlement, with seral species dominant. Stand productivity would be expected to increase.

g) **Air Quality** – Full compliance with applicable air quality laws would be achieved by securing approval from the Montana-Idaho state airshed group prior to any burning operations. Burning associated with slash disposal would only be done on days with good to excellent smoke dispersion.

h) **Visual Quality** – Reduced stocking levels, fresh slash and skid trails could affect the appearance of the project area. Following treatment, all stands would have a more open appearance.

i) **Wildlife** – The proposed harvest operations present a minimal likelihood of negative impacts to Threatened and Endangered Species. Those potential impacts that do exist have been mitigated to levels within acceptable thresholds. The same is true for those species that have been identified as "sensitive" by the DNRC. The effects of the proposed action on Big Game species would be low due to habitat not being a limiting factor in the project area.

3. PRECEDENT SETTING AND CUMULATIVE IMPACTS

The project area is located on State- owned lands, which are "principally valuable for the timber that is on them or for growing timber or for watershed" (**MCA 77-1-402**). The proposed action is similar to past projects that have occurred in the area. Since the EA does not identify future actions that are new or unusual, the proposed timber harvest is not setting precedence for a future action with significant impacts.

Taken individually and cumulatively, the identified impacts of the proposed timber sale are within established threshold limits. Proposed timber sale activities are common practices and none of the project activities are being conducted on fragile or unique sites.

The proposed timber sale conforms to the management philosophy adopted by DNRC and is in compliance with existing laws, policies, guidelines, and standards applicable to this type of action.

4. SHOULD DNRC PREPARE AN ENVIRONMENTAL IMPACT STATEMENT (EIS)?

Based on the following, I find that an EIS does not need to be prepared:

a) The EA adequately addressed the issues identified during project development, and displayed the information needed to make the pertinent decisions.

b) Evaluation of the potential impacts of the proposed timber sale indicates that significant impacts to the human

environment will not occur as a result of the implementation of The Action Alternative.

c) The ID Team provided opportunities for public review and comment during project development and analysis.

// Jeff Rupkalvis

Jeff Rupkalvis
Forest Management Supervisor-Decision Maker
DATE: *10-18-2011*

Washoe Creek Timber Sale Environmental Assessment

Cover Sheet

Proposed Action:	The Montana Department of Natural Resources and Conservation (DNRC) proposes to harvest approximately 14,000-21,000 tons (2-3 million board feet) of saw timber on approximately 345 acres, within Section 36, T 13 N, R 15 W (State School Trust Lands). The proposed Timber Sale activities could begin as early as June 2011. Activities associated with proposed project would include the contracted harvest of timber, construction of new roads and maintaining and improving existing roads. The Contract term would likely be three years; although the burning of slash and post harvest weed spraying activities may not be completed until 2014. These dates are approximate.
Type of document:	Environmental Assessment
Lead agency:	Montana Department of Natural Resources and Conservation (DNRC)
Responsible Official (Decision Maker):	Jeff Rupkalvis Missoula Unit DNRC 3206 Maverick Lane, Missoula, MT 59804 (406) 542-5803 jrupkalvis@mt.gov
For further information Contact (Project Leader):	Richard Stocker Missoula Unit DNRC **Mailing address:** Department of Natural Resources and Conservation ATTN: Richard Stocker 2705 Spurgin Road, Missoula, MT 59804-3199 (406) 542-5810 rstocker@mt.gov
Special Note:	Comments received in response to this Environmental Assessment will be available for public inspection and will be released in their entirety if requested pursuant to the Montana Constitution.

How to Read this EA
(Environmental Assessment)

To read this EA more effectively, carefully study this page. Following State regulations, we have designed and written this EA (1) **to provide** the Project Decision Maker with sufficient information to make an informed, reasoned decision concerning the proposed Washoe Creek Timber Sale and (2) **to inform** members of the affected and interested public of this project so that they may express their opinions to the Project Decision Maker.

This EA follows the organization and content established by the EQC Regulations (ARM 36.2.521-36.2.543). The EA consists of the following chapters.

1.0 Purpose and Need for Action
2.0 Alternatives, Including the Proposed Action
3.0 Affected Environment
4.0 Environmental Consequences
5.0 List of Preparers
6.0 List of Agencies and Persons Consulted
7.0 References
8.0 Appendix

Chapters 1 and 2 together serve as an Executive Summary. It is the intention that the reader will understand the proposal and the potential environmental, technical, economic, and social consequences of the proposed Action and the No-Action Alternative.

- **Chapter 1** introduces the Washoe Creek Timber Sale. It provides a very brief description of the proposed project and goes on to explain the following three aspects:
  (1) The relevant environmental issues.

  (2) The decisions to be made.

1.0 Chapter 1: Purpose of and Need for Action

1.1 Proposed Action: Harvest

The Montana Department of Natural Resources and Conservation (DNRC) proposes to harvest timber from the Washoe Creek Section 36, T13N, R15W. The implementation of Action Alternative would yield approximately 14,000-21,000 tons (2-3 million board feet) of timber from approximately 345 acres. This would generate revenue for the benefit of the Common School (CS) grant. The proposed action could be implemented as early as July 2011 and may be completed by 2014. The burning of slash and weed spraying activities may be finished by 2014. These dates are approximate.

1.2 Location

The proposed sale is located in Section 36, T13 N, R 15 W Missoula County approximately 24 miles east of Missoula, Montana, approximately 6 miles southeast of Potomac. Washoe Creek is within and part of the Blackfoot River drainage.

1.3 Need for the Action

The lands involved in this proposed project are held by the State of Montana in trust for the support of specific beneficiary institutions. These include public schools, state colleges and universities, and other specific state institutions such as the School for the Deaf and Blind (Enabling Act, February 22, 1889; 1972 Montana Constitution, Article X, Section 11). The Board of Land Commissioners and Department of Natural Resources and Conservation (DNRC) are required by law to administer these Trust Lands to produce the largest measure of reasonable and legitimate advantage over the long run for these beneficiary institutions (Section 77-1-202, MCA).

1.4 Project Objectives

In order to meet the goals of the management philosophy adopted through programmatic review of the State Land Forest Management Plan (SLFMP) DNRC, 1996, and defined in the Administrative Rules for Forest Management (ARM 33.11.401 through 456), the Department has set the following specific project objectives:

- Generate a reasonable and legitimate amount of revenue for the Common School Trust Grant by harvesting approximately 14,000-21,000 tons (2-3 million board feet) of timber.
- Promote forest health and vigor of timber stands and subsequently help prevent and or decrease the incidence of insect and disease infestations.
- Regenerate portions of stands where tree growth is declining.
- Maintain and promote attributes of biologically diverse forests and critical elements and habitats with respect to Threatened and Endangered Species, and

where not at odds with Trust Mandates and ARM, sensitive wildlife and plant species.
- Secure permanent access to the Washoe Creek DNRC Section 36, T13N, R15W.

1.5 Decisions to be Made

- Determine if alternatives meet the project objectives.
- Determine which alternative should be selected.
- Determine if the selected alternative would cause significant impact(s) to the Human Environment, requiring the preparation of an Environmental Impact Statement (EIS).

1.6 Relationship to the State Forest Land Management Plan

The DNRC would manage lands involved in this project in accordance with the State Forest Land Management Plan (DNRC 1996) and the Administrative Rules for Forest Management (ARM 36.11.401 through 456) as well as other applicable state and federal laws.

1.7 History of the Planning and Scoping Process Public Involvement - Agencies, Individuals or Groups Contacted

Comments from the general public, interest groups and agency specialists were solicited in August 2004. A Newspaper legal notice was run in the Missoulian, on August 1,8,15 and 22 of 2004. Scoping notices were mailed to 53 individuals and or organizations (a list of the organizations/individuals contacted is available in the project file). Written comments were received from the following organizations: Montana Department of Fish, Wildlife and Parks and the Tribal Preservation Office of the Confederated Salish and Kootenai Tribes.

In August of 2009 scoping notices were again sent to residents and adjacent landowners, specifically Union Creek Ranch and those along Washoe Road, Hole-in-the-Wall Road indicating that the DNRC was considering hauling forest products to the west from DNRC's Washoe Section, across Union Creek Ranch and down Washoe Road, Hole-in-the Wall Road and Potomac Road. No comments were received.

In April 2010 the DNRC scoped residents along Swanson Lane and Potomac Road, soliciting comments should this route be used to haul forest products. One comment was received (via telephone), the individual concern is to maintain the native portion of Swanson Lane beyond the point that the Missoula County maintains same.

The repeated scoping was driven by transportation planning issues and the objective of acquiring permanent access to DNRC's Washoe Section 36, T13N, R15W.

The following resource specialists were involved in the project design, assessment of potential impacts, and development of mitigation measures: Mike McGrath - Wildlife

Biologist, DNRC, South Western Land Office (SWLO); Jeff Collins- Hydrologist, DNRC, SWLO; Patrick Rennie - Archeologist, Agriculture and Grazing Management Bureau (AGMB), DNRC, Helena; Jeff Rupkalvis-Decision Maker/ Supervisory Forester, Missoula Unit, DNRC; Richard Stocker-Project Leader/ Forester, Missoula Unit, DNRC.

1.8 Other environmental assessments (EAs) or projects related to this project

1.8.1

Other DNRC EAs and Proposals: Ryan Gulch Salvage Timber Sale EA 2000. Cramer Creek Timber Sale EA 2002. Turah Creek Timber Sale EA 2002. Elk 36 Timber Sale EA 2002. Dirty Ike Salvage Timber Sale EA 2003. Lost Bear Timber Sale EA 2003. Tyler Creek Timber Sale EA 2005. Dry Bear Mouth Timber Sale EA 2005. Hay Wire Wallace Timber Sale EA 2006. The Lolo Land Exchange, between DNRC and US Forest Service 2006. Packer Gulch Fire Salvage Supplemental EA 2006. Montana Legacy Project 2008 (land sale from Plum Creek Timber Company to The Nature Conservancy and subsequently to DNRC 2010).

1.9 Permits, Licenses, and Other Authorizations Required:

1.9.1 124 Permit

A Stream Protection Act Permit (124 Permit) is required from the Department of Fish, Wildlife and Parks (DFWP) for activities that may affect the natural shape and form of a stream's channel, banks, or tributaries. A 124 Permit would be required to replace culverts for two Class 2 and one Class 3 streams tributary to Washoe Creek in DNRC Section 36, T13N, R 15W.

1.92 Montana/Idaho Airshed Group

DNRC is a member of the Montana/Idaho Airshed Group, which aims to minimize impacts from smoke generated by burning activities related to forest management. This is achieved by coordination between the group's members. As a member of the Airshed Group, the DNRC agrees to burn only on days that are approved for good smoke dispersion, as determined by the Smoke Management Unit in Missoula, Montana.

1.9.3 Habitat Conservation Plan

DNRC has been developing a Habitat Conservation Plan (HCP) under Section 10 of the Endangered Species Act for several years. If successful, the process will culminate with issuance of an Incidental Take Permit (Permit) by the USFWS. The Draft HCP/EIS was distributed for public review in June of 2009. The Final HCP/EIS was distributed for public review in August of 2010. The HCP identifies specific mitigation requirements for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia

redband trout. As part of a phased-in approach to prepare for HCP compliance, DNRC planned this project to be in compliance with (1) the current rules (ARMs) that govern the forest management program, and (2) all applicable conservation commitments contained in the Preferred Alternative in the Final EIS/HCP. Should a different Alternative be selected, revisions to the project may be made to comply with the selected Alternative.

1.10 Issues

The following issues were identified during the scoping process. They constitute the basis for the formation of project specifications, development of mitigation measures, and assessment of environmental impacts.

1.10.1 Issues Studied in Detail

1.10.1.1 Water Quality

There is a concern that the proposed forest management activities may cause impacts to water quality as a result of increased erosion and sediment delivery to streams.

1.10.1.2 Water Yield

What are the expected effects of the proposed action on water yield?

1.10.1.3 Cumulative watershed effects

There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of increased water yields.

1.10.1.4 Geology/ Soil Resources

Timber harvest activities may result in increased erosion and reduced soil productivity due to excessive disturbance, compaction and displacement, or loss of nutrients depending on area and degree of harvest effects.

1.10.1.5 Cold Water Fisheries

Washoe and Union Creeks are westslope cutthroat trout streams and there is a concern that the proposed forest management actions may have effects to fisheries by changes in water quality, quantity or sedimentation.

1.10.1.6 Noxious Weeds

There is a concern that the proposed forest management activities may introduce or spread noxious weeds.

1.10.1.7 Forest Vegetation

The Montana Administrative Rules for Forest Management in part directs DNRC Forest Managers to emulate natural disturbance patterns and manage towards the "desired future condition" (as defined in ARM).

Timber harvesting and associated activities may affect forest cover types and their distribution. Would the proposed action emulate natural disturbances and facilitate the maintenance or development of forest conditions that were indicative of historic conditions and move forests in the Project Area towards the "desired future condition"?

This timber harvest, in conjunction with other past timber sales, may affect the landscape in a way atypical of anticipated historic conditions.

Old Growth

Old stands occurred and developed naturally and in part as a response to the effects of naturally occurring fire. This is the rationale for including discussions for Old Growth within the context of Natural Forest Conditions.

There is concern that the proposed harvest activities may negatively impact Old Growth Stands (as defined by Green et. al. 1992, and adopted in ARM).

1.10.1.8 Air Quality

Concern that harvest activities including burning and hauling would adversely affect local air quality.

1.10.1.9 Public Safety

Concern that traffic associated with the harvest may adversely affect the safety on and along the following roads: Swanson Lane, Hole-in-the-Wall Road, Washoe Road and Potomac Road.

1.10.1.10 Recreational Use

Concern that harvest activities would adversely affect recreation within the area.

1.10.1.11 Economic Benefits and Project Revenue

What is the revenue that this project would provide to the trust beneficiaries?

1.10.1.12 Visual Quality

What are the anticipated effects of timber harvesting and road construction upon far views?

Wildlife

1.10.1.13 Grizzly Bears

There is concern that the proposed action would negatively affect grizzly bears, a federally threatened species, through increased open road densities and sight distances.

1.10.1.14 Canada Lynx

There is concern that the proposed action would negatively affect Canada lynx, a federally threatened species, through reductions in foraging and suitable habitat.

1.10.1.15 Pileated Woodpeckers

There is concern that the proposed action may negatively affect pileated woodpeckers and their habitat.

1.10.1.16 Fisher

There is concern that the proposed action may negatively affect fisher habitat.

1.10.1.17 Flammulated Owl

There is concern that the proposed action may negatively affect flammulated owl habitat.

1.10.1.18 Elk

There is concern that the proposed action may negatively affect elk summer habitat.

1.10.1.19 Northern Goshawk

There is concern that the proposed action may negatively affect northern goshawk habitat.

1.10.1.20 Great Gray Owl

There is concern that the proposed action may negatively affect great gray owl habitat.

1.10.2 Issues Eliminated from Further Study

1.10.2.1 Wildlife

1.10.2.1.1 Threatened and Endangered Species

1.10.2.1.1.1 Bald Eagle (Federally threatened)

There is concern that timber harvest activities would alter bald eagle habitat or provide unnecessary disturbance. The Project Area is

approximately 6 miles south of the nearest known bald eagle nest. Thus, due to the distance between the nest and Project Area, there would be low risk of direct, indirect, or cumulative effects to bald eagles as a result of the proposed action.

1.10.2.1.1.2 Gray Wolf (Federally threatened)

There is concern that timber harvest activities would alter gray wolf habitat or provide unnecessary disturbance for a federally endangered species. The Project Area is approximately 15 miles west of the nearest known wolf territory. Thus, due to the distance between the territory and Project Area there would be low risk of direct, indirect, or cumulative effects to gray wolves as a result of the proposed action

1.10.2.1.2 Sensitive Species

The following species were considered but eliminated from detailed study due to lack of habitat present: Peregrine Falcon, Townsend's Big-eared Bat, Black-backed woodpecker, Common Loon, Harlequin Duck, Columbian Sharp-tailed Grouse, Northern Bog Lemming, Coeur d'Alene Salamander, and Mountain Plover.

1.10.2.1.3 Other Sensitive or Rare Plants and Animals

The Montana Natural Heritage Program database was researched for other plant and animal species of concern.

None are known to exist within the Project Area nor would any be affected as a result of implementation of the project.

1.10.2.2 Archeology and Historical Sites

An assessment was made by the DNRC archeologist. There is no evidence that cultural resources are present within the Project Area (Washoe Section 36, T13N, R15W).

2.0 Alternatives Including the Proposed Action

2.1 Introduction

Chapter 2: The purpose of Chapter 2 is to describe the alternatives and compare the alternatives by summarizing the environmental consequences.

Alternatives were developed as a result of identification of relevant issues through the scoping process. Input from Interdisciplinary Team (IDT) specialists, including identification of relevant issues, shaped alternative development. The Action Alternative conforms to the requirements of the Administrative Rules for Forest Management and the Trust Land Mandate.
Chapter 2 describes and compares the alternatives by summarizing (1) the attainment of the project objectives and (2) the predicted environmental consequences.

This chapter has six sections:

- Process Used to Formulate the Alternatives
- Alternative Design Criteria
- Description of Proposed Alternatives
- Suggested Mitigation Measures of Alternative B: Harvest
- Description of Relevant Past, Present, and Reasonably Foreseeable Future DNRC Actions Not Part of the Proposed Action
- Summary Comparison of the Activities, the Predicted Achievement of the Project Objectives and the Predicted Environmental Effects of the Alternatives

2.2 Development of Alternatives

In August of 2004, a DNRC Interdisciplinary Team (IDT) began analyzing the Project Area and initiated internal review and public scoping to develop a management plan. Two written responses were received from external parties (DFWP and The Tribal Historic Preservation Office). Issues identified during the scoping process were defined and are summarized in Chapter I. Input from Interdisciplinary Team (IDT) specialists, including identification of relevant issues, shaped alternative development. The Action Alternative was developed in part to address relevant issues.

2.3 Alternative Design Criteria

The DNRC IDT identified the following design criteria:

- Comply with the Montana Environmental Policy Act (MEPA)
- Comply with the Montana Administrative Rules for Forest Management and Streamside Management Zones.
- Comply with the requirements of the Endangered Species Act (ESA)
- Comply with all other applicable Federal and State of Montana Laws and Rules.

The proposed Action Alternative adequately addressed relevant issues and met project objectives. Therefore no other alternatives were considered.

2.4 Description of Alternatives

2.4.1 Alternative A: No Action

Activities associated with the Timber Harvest Alternative would not occur on the Project Area at this time. No revenue would be generated for the Common School Trusts for the specific Lands included within the Project Area. DNRC permitted and approved activities would continue in the Project Area.

2.4.1.1 Continuing actions not part of the Proposed Action

- **Livestock grazing:** an existing grazing license would continue within the Project Area.

- **Fire suppression:** human and natural caused fires would be actively suppressed.

- **Hunting and other recreational uses:** deer, elk, and upland game hunting would continue under the rules of the Montana Department of Fish, Wildlife, and Parks. Walk in and non-motorized vehicle recreational use would continue.

- **Control of weeds:** The DNRC employs an integrated approach to weed control including monitoring and administering weed control activities. The grazing licensee has responsibility for weed control on the Washoe Creek Section.

- **Public vehicle access:** Motorized access to the DNRC Washoe Creek Section 36, T13N, R15W would remain restricted. Walk-in hunting is allowed, although there is a gate in SW, SW Section 2, T12N, R15W that restricts motorized access to within approximately 2 miles road distance of the south boundary of the Washoe Creek Section from October 15-May 1. The gate in Section 2 is open at times other than those previously mentioned, but only non-motorized activities are permitted within the Washoe Creek Section. All existing and newly constructed roads would be closed to unauthorized motorized use except during emergencies, such

as fire suppression and rescue operations. Road access would be restricted on DNRC ownership to the grazing licensee, authorized contractors, and DNRC employees charged with administrative duties and functions. Non-motorized access to DNRC lands would continue.

All of the aforementioned activities would also occur if Alternative B: Harvest were implemented.

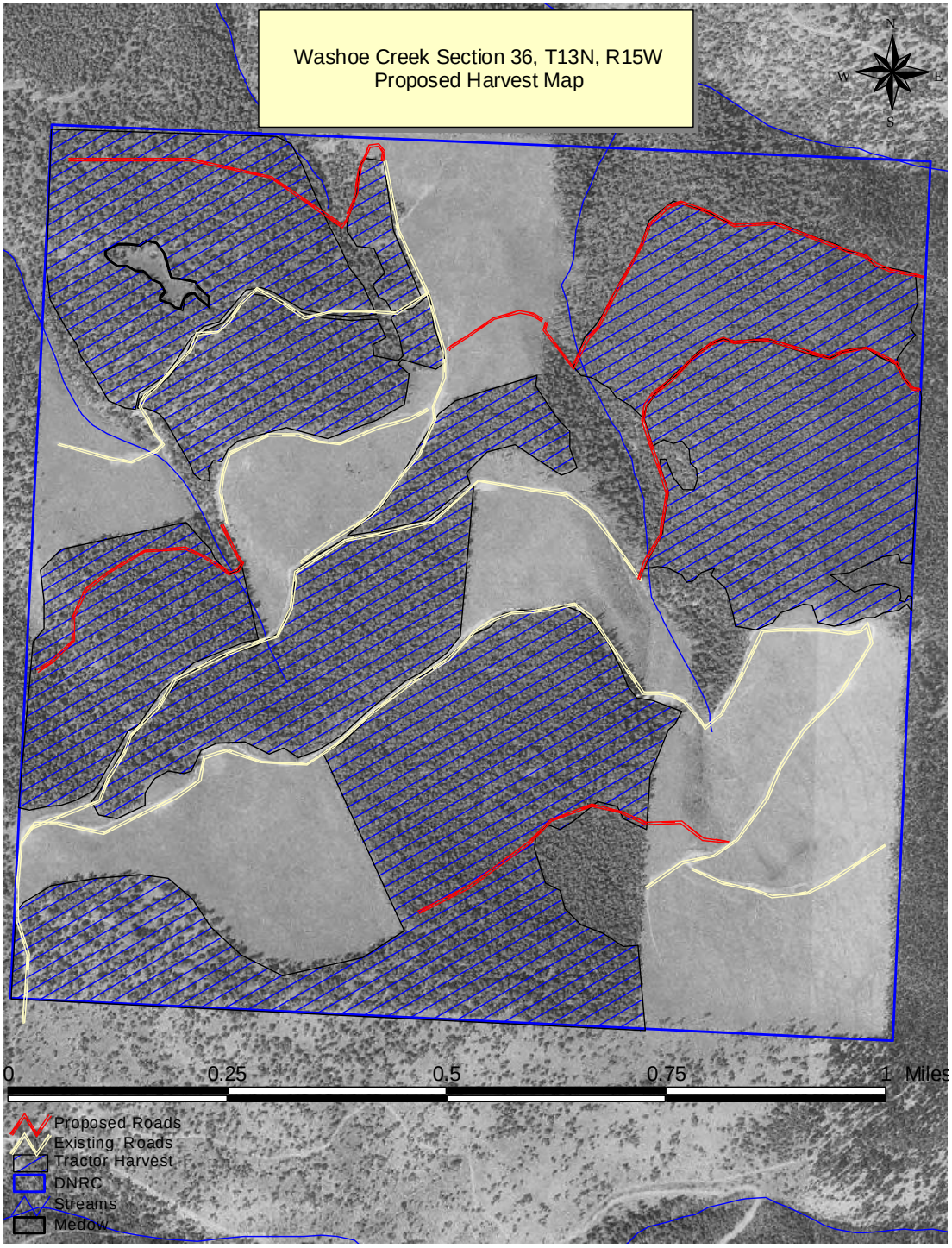
2.4.2 Alternative B: Harvest

- The proposed harvest would yield approximately 14,000-21,000 tons of saw-timber, from approximately 345 acres. Refer to Figure 2-1 Harvest map. Approximately 345 acres would be harvested with ground based equipment.
- Approximately 87 acres of timbered stands would be deferred from harvest of which approximately 40 acres are classified as Mature Foraging Lynx Habitat, (approximately 37 acres are located in the SE ¼ and NE ¼ of the Washoe Section 36, T13N, R15W) and approximately 34 acres of Old Growth of the Western larch/ Douglas-fir type (as defined by Green et al) would not be harvested. Of this, approximately 28 acres is both Mature Foraging Lynx Habitat and Old Growth and would be deferred for Lynx (ARM 36.11.436).
- Harvesting would not occur within Stream-side Management Zones (SMZ) or Riparian Management Zones (RMZ). New road construction would occur within segments of SMZ's and across two Class Two and one Class Three streams.
- Maintenance and repairs would be completed on access roads and two stream crossings on Union Creek access roads would be replaced to improve fish passage and reduce sedimentation.
- Approximately 1 snag and 1 snag recruit per acre would be retained within harvest areas. Trees selected for snags would be ≥ 21" diameter breast height (dbh), where available. If no snags ≥ 21" dbh are available then the next largest available size tree would be retained. Trees with extensive rot would be favored for retention as evidenced by broken boles, conks and cavities.
- Within harvest areas that are Old Growth (as defined by Green et al) a minimum of 8 trees per acre (tpa) ≥ 21"diameter breast height (dbh) ≥ 170 years old would be retained.
- Within harvest areas that are classified as Lynx Habitat (approximately 130 acres) a minimum of 40% crown closure would be maintained. It is estimated that the basal area (square foot cross sectional area of trees at d.b.h., per acre) retained within Lynx habitat would range from between approximately 50-80 square feet. Some shade intolerant species such as subalpine fir and spruce would be retained within Lynx Habitat.
- For the remainder of the harvest area (approximately 215 acres that is not classified as Lynx Habitat) approximately 40-60 square feet of basal area would be retained in stands, (with exceptions noted above) consisting of well formed, well developed, insect and disease free trees, exhibiting better than poor vigor. Shade intolerant tree species such as Ponderosa pine and Western

larch, would be retained where available. Trees would be retained in groups or as individuals in a non-uniform spatial arrangement.

- Approximately 2 ½-3 miles of road would be constructed within Washoe Section 36, T13N, R15W in order to access harvest areas. Following harvest all new and existing roads within the Washoe Creek Section would be closed or remain closed to motorized public traffic.
- A portion of the logging slash would be retained or returned within harvest areas. Approximately 5-10 tons per acre of coarse woody debris (>3" in diameter) and including finer fuels (< 3'' diameter, limbs and foliage) total accumulations of up to approximately 30 tons per acre, in some areas, would be retained or returned within harvested areas. Slash would be lopped and or trampled to within 18" or less of the ground. Slash would be cured for approximately one year, after which the DNRC would assess the need and benefit of burning any portion of the slash within harvested areas. Excessive amounts of slash, accumulations at landings and along roads, that were not scattered, would be piled and burned. Fuel breaks would be employed along property boundaries and along the ridge top.

Figure 2–1: Map of Alternative B: Harvest



2.5 Mitigation Measures of Alternative B: Harvest

The Harvest Alternative would incorporate some of the following mitigations by design and some would be incorporated through requirements within the Timber Sale Contract. Some issues and the associated mitigations are implemented programmatically. How the mitigations are incorporated is explained for each.

2.5.1 Harvest Unit General Design

- The Harvest Alternative by design would provide that approximately 1 snag and 1 snag recruit per acre would be retained within harvest areas. Trees selected for snags would be ≥ 21" diameter breast height (dbh), where available. If no snags ≥ 21" dbh are available then the next largest available size tree would be retained. Trees with extensive rot would be favored for retention as evidenced by broken boles, conks and cavities.

- The Harvest Alternative would, through Timber Sale Contract stipulations, and administration, minimize soil impacts by limiting the total soil disturbance area in a unit. This would be accomplished by using existing trails, skid trail planning and design, and maintaining nutrient cycling by retaining woody debris and foliage.

- The Harvest Alternative would limit ground skidding to slopes of 45% or less approximately; except on sensitive soils, where ground skidding would be confined to slopes 35% or less approximately. The objective is to minimize excessive disturbance such as compaction, displacement, rutting, and subsequent erosion.

- The Harvest Alternative would, through Timber Sale Contract stipulations, limit ground skidding to periods when soils are in one of the following conditions: frozen, snow covered and or dry (soil moisture less than or equal to 20% of oven dry weight). The objective is to minimize excessive disturbance such as compaction, displacement, rutting, and subsequent erosion.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require installation of various surface drainage features on skid trails, landings, and roads in order to conserve soils, protect roads and protect water quality.

- The Harvest Alternative would protect localized sensitive soils, steep slopes, and moist areas by implementing equipment restriction zones.

- The Harvest Alternative would comply with all Streamside Management Zone Laws/Rules and Forest Management Rules.

2.5.2 Road Design

- The Harvest Alternative would employ forestry Best Management Practices (BMPs) as the minimum standard for all harvest and road activities associated with the proposed timber sale.

- The IDT designed a transportation plan that would facilitate near and long term transportation needs, including acquiring permanent access to the Washoe Creek Section 36, T13N, R15W and minimize new road construction. Practical, economical, and technical elements with respect to roads and road standards were considered to facilitate harvest. Construction and maintenance of necessary roads was considered within the context of potential affected resources. The Harvest Alternative would by design improve existing road systems to meet long-term access needs and to fully comply with current BMPs.

- The existing Union Creek road crossings would be replaced to improve fish passage connectivity that would incorporate a stream channel emulation design and site specific mitigations to reduce sedimentation.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require construction of drain dips, grade rolls and other drainage features where necessary and practical to insure adequate road surface drainage. Timber Sale Contract stipulations would require construction, reconstruction of roads and maintenance of roads, including installation and or construction of road surface drainage features prior to hauling. Maintenance of roads would continue as necessary and would be concurrent with harvest activities. At the completion of harvest activities a final blading of road surfaces would be required.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require application of grass seed to newly constructed or reconstructed road cut and fills.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require temporary or abandoned roads to be left in a stable condition that would provide adequate drainage and would not require future maintenance.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require construction of drainage features on approaches to draw and stream crossings to avoid concentrating runoff at crossing sites. The location of these drainage features would minimize the runoff contributing area and provide for effective sediment filtering.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require the cleaning of the inlets and outlets of culverts, including implementation of additional sediment mitigation measures as necessary.

2.5.3 Soils and Water- Site-Specific Design

- **Down Woody Material:** The Harvest Alternative would, through Timber Sale Contract stipulations, require that the majority of the logging slash would be retained or returned within harvest areas. Approximately 5-10 tons per acre of coarse woody debris (>3" in diameter) and including finer fuels (< 3'' diameter, limbs and foliage) total accumulations of up to approximately 30 tons per acre, in some areas, would be retained or returned within harvested areas. Slash would be lopped and or trampled to within 18" or less of the ground. On slopes greater than 45%, this would be accomplished through retention of slash on site by log length skidding or whole tree harvest if tops and limbs were left on site. It is recommended that slash be returned from the landings back into the harvest unit as it is created. The slash would be well distributed, evenly throughout the unit and would be placed in trails to minimize disturbance to soils. Large amounts of slash would not be allowed to accumulate at the landings before it is returned in the unit. Slash would be cured for approximately one year, after which the DNRC would assess the need and benefit of burning any portion of the slash within harvested areas. Excessive amounts of slash, accumulations at landings and along roads, that were not scattered, would be piled and burned. Fuel breaks would be employed along property boundaries and along the ridge top.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require installation and maintenance of adequate erosion control in harvest units, and skid trails as needed concurrent with operations. Erosion control would be completed prior to acceptance of skidding operations by the Forest Officer.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require rock armoring of both the inlet and outlet of all corrugated metal pipe (CMP) installations and energy dissipaters at outfall of all wet CMP installations.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require mitigations for activities in and around stream and draw crossings (i.e. installing new CMPs, cleaning inlets and outlets, constructing ditches, excavating material etc.) special care would be taken so as not to cause an excessive amount of disturbance to the stream channel, vegetation or area immediately adjacent to the crossing site. Excess or waste material would be disposed of at a location where it would not erode directly into the stream or draw bottom.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require road use and hauling be limited to dry (sufficient to prevent rutting), frozen and or snow covered conditions. The objective is to prevent sub-surface rutting of roads, prevent damage or displacement of road surface

materials and to facilitate function of surface drainage features. Operations would be suspended when these conditions were not met, prior to degradation of road surfaces.

- The Harvest Alternative would comply with all applicable laws including the SMZ Law. Marking and maintenance of minimum SMZ widths consistent with law would be the minimum standard. Further protection to streams and riparian areas would be accomplished by following the ARM for Forest Management, Watershed Management-SMZ, and Riparian Management Zones (RMZ's) where needed.

- The Harvest Alternative would protect all ephemeral draws. Protect springs, and wet areas with marked equipment restriction zones (ERZ).

2.5.4 Integrated Weed Management

To reduce current noxious weed infestations and limit the spread of weeds the following integrated weed management mitigation measures for prevention and control would be implemented should the Harvest Alternative be selected:

- The Harvest Alternative would, through Timber Sale Contract stipulations, require cleaning of all road construction and harvest equipment of plant parts, mud, and weed seed to prevent the introduction of additional noxious weeds. The equipment would be inspected by the Forest Officer prior to moving on site.

- The Harvest Alternative would, through Timber Sale Contract stipulations, require prompt re-vegetation of all newly disturbed soils on road cut and fill slopes with site-adapted grasses (including native species) to reduce weed encroachment and stabilization of roads to prevent erosion.

- Ongoing integrated weed management on Missoula Unit may include establishing bio-control agent sites for knapweed within the Project Area on larger infestations, where appropriate.

- The Harvest Alternative would, through Weed Spraying Contract stipulations, require herbicide applications along portions of roads within the Project Area and treatment of spot outbreaks of noxious weeds as determined by the ID team.

- Ongoing integrated weed management on Missoula Unit would include monitoring of disturbed sites within the Project Area for any new noxious weeds and develop plans as needed to address weed problems. If new infestations of noxious weeds are noted, a weed management plan would be developed.

2.5.5 Harvest within Old Growth

Within harvest areas that are Old Growth (as defined by Green et al) a minimum of 8 trees per acre (tpa) ≥ 21"diameter breast height (dbh) ≥ 170 years old would be retained.

2.5.6 Public Safety- Trucks hauling of Forest Products

The Timber Sale Contract would contain stipulations for signing roads to warn motorists of potential hazards associated with encountering log trucks.

2.5.7 Air Quality- Burning and Road Dust

DNRC would submit plans for slash burning to the Smoke Monitoring Unit of the Montana/Idaho Airshed Group. Burning would only be conducted as allowed by the Smoke Monitoring Unit, which would occur during periods of good to excellent smoke dispersion conditions.

The Timber Sale Contract would specify mitigations for road dust such as, restricting season of use, and wetting or use of dust abating treatments on road surfaces. These mitigations would be used for road segments near residents should dust become an issue. Wetting of the road surface would occur when the road surface is dry or hauling would be limited to frozen or snow packed conditions. A dust abatement agent (e.g. magnesium chloride or mercatum) would be applied to the road surfaces, as necessary, to mitigate dust near residences should dust become an issue. Timing of hauling and road maintenance activities, to a limited extent would mitigate the situation for residents potentially exposed to dust from native surface roads. The DNRC would continue to be responsive in a prudent manner to reasonable concerns with respect to the health and safety of local residents and motorists.

2.5.8 Visual Quality Mitigation Recommendations

Trees would be retained in groups or as individuals in a non-uniform spatial arrangement. Roads would be located so they would not be seen from Highway 200 and or would be mostly hidden from view. This would be accomplished by utilizing benches and flatter ground where possible and retaining trees along roads to obscure them. Timber stand variability would be preserved through retention of trees from different age and or size classes of healthy dominant or co-dominant trees. Dominant trees would be retained provided they are healthy, of good form and better than poor vigor. Where harvest areas coincide with "Lynx Habitat" (approximately 130 acres and 38% of proposed harvest area), sufficient tree canopy would be left so as to provide a minimum of 40% crown closure (percent area of tree crowns compared to a given area). Crown closure would be provided by retaining dominant seral tree species; some pole size trees and saplings would provide cover as well. Within portions of harvest areas advanced regeneration of shade tolerant species (sub-alpine fir and spruce saplings) would be retained along with intolerant species. As a result naturally created patterns would be retained. The reduction of tree crown cover within harvest areas would relieve the hard edge effect along 1989 clear-cut boundaries. Group selection and shelterwood

harvests, especially along edges would further relieve the edge effect that was a result of the 1989 harvest.

2.5.3.1 Threatened and Endangered Species

The Harvest Alternative would, through Timber Sale Contract stipulations require, that if active den sites or nest sites of threatened, endangered, and/or sensitive species were located within the Project Area, a cessation of activities would be invoked until such time as a DNRC Biologist could review the site and develop species appropriate protective measures.

The Harvest Alternative would, through Timber Sale Contract stipulations, require the following:

1. In the event any threatened or endangered species were encountered during the project implementation periods a cessation order would be issued by the Forest Officer to the Purchaser.

2. All project-related activities that would potentially affect that species would cease. The DNRC Biologist would be informed immediately and be instrumental in designing additional habitat protection measures where appropriate.

3. Additional mitigations would be consistent with the administrative rules for managing Threatened and Endangered Species (ARM 36.11.428 through 36.11.435) and the Endangered Species Act. The implementation of these mitigations would be at the sole discretion of the DNRC.

2.5.3.1.1 Grizzly Bears

The Harvest Alternative would, through Timber Sale Contract stipulations, require implementation of sanitation restrictions during the non-denning period (April 15 - November 15) for operations related to the proposed action if grizzly bear activity is documented in the analysis area.

1. Sanitation in all operations associated with the Harvest Alternative would comply with all applicable State laws, rules and regulations concerning sanitation.

2. Refuse from foodstuffs including its packaging would be removed daily or secured in an approved bear resistant container.

3. Foodstuffs would be contained in an approved bear resistant container should camps be allowed within the Gross Sale area.

2.5.3.1.2 Canada Lynx

The Harvest Alternative would by design provide that in those portions of the Project Area where the proposed harvest overlaps suitable lynx habitat (i.e., denning, young foraging, mature foraging, or other habitat):

(1) the post-harvest conditions would meet ≥40% crown cover in sapling, pole, mature and old stands to retain Lynx Other habitat characteristics;

(2) ≤ 10% of the stand area would be retained in subalpine fir and Engelmann spruce regeneration, where present in the affected mature foraging and "other" lynx habitat stands.

The Harvest alternative would, through Timber Sale Contract stipulations require skid trail planning and special operation requirements i.e. protect sub-merchantable trees within the designated stands (classified as Lynx Habitat).

2.5.3.2 Sensitive and Other Wildlife Species

2.5.3.2.1 Pileated Woodpeckers and Fishers

The Harvest Alternative would by design provide that in those portions of the Project Area proposed for harvest, snags, snag recruits and coarse woody debris would be recruited in accordance with ARMs 36.11.411 and 36.11.440 (1)(b)(iii), respectively. Additionally, for fishers in accordance with ARM 36.11.440 (1)(b)(i) and (i)(A), along class 2 streams on the affected parcel, the proposed action would maintain 75% of the area within 50 ft of the stream in ≥40% crown closure.

2.5.3.2.2 Flammulated Owls

The Harvest Alternative would, by design, provide that in those portions of the Project Area proposed for harvest, snags and snag recruits would be recruited in accordance with ARMs 36.11.411 and 36.11.440 (1)(b)(iii).

2.5.3.2.3 Big Game: Elk

The Harvest Alternative would, through Timber Sale Contract stipulations require, effective closure devices (e.g., locked gates, tank traps, other obstructions: rocks, woody debris) at project's completion, for newly constructed or reconstructed roads associated with the proposed action, where motorized access is not currently restricted.

2.5.3.2.4 Northern Goshawk

The Harvest Alternative would, require that those portions of the Project Area proposed for harvest which overlap potential nesting habitat would

be treated with a prescription that would retain ≥ 40% canopy closure post-harvest.

2.5.3.2.5 Great Gray Owl

The Harvest Alternative would, require that those portions of the Project Area proposed for harvest which overlap potential nesting habitat would be treated with a prescription that would retain ≥ 40% canopy closure post-harvest.

2.6 Environmental Effects of Alternatives

2.6.1 Summary comparison of Project Activities

Table 2-1: Summary of Project Activities of Alternatives A and B.
The following table provides a comparison of the harvest activities that would occur if either Alternative A or B were implemented.

Activity	Alt. A	Alt. B
HARVEST (ACRES)	0	345
Tractor yarding (approximate acres)	0	345
Road construction (approximate miles)	0	2.75

All roads in the Project Area would remain closed to motorized public use after the project is completed.

2.6.2 Summary comparison of achievement of Project Objectives

Table 2-2: Summary Comparison of achievement of Project Objectives

Objective	Indicators	Alt. A	Alt. B
Harvest approximately 14,000-21,000 tons of timber to generate revenue for the School (CS) grants.	Stumpage receipts in dollars	0	Generate approximately $350,000-525,000 for the Common School Grants
Promote forest health and vigor, reduce incidence of insects and disease.	Acres treated	0	Approximately 345 acres
Regenerate portions of stands where tree growth is declining.	Acres treated	0	Equivalent to approximately 20 acres of openings and areas with ≤ 40 sq. ft. of basal area scattered throughout the harvest area
Maintain critical elements of biologically diverse forests with respect to Threatened and Endangered Species.	Acres of Lynx Habitat protected	Approximately 187 acres	Approximately 187 acres

2.6.3 Summary comparison of Environmental Effects

Table 2-3: Summary of Environmental Effects

ISSUE	Alternative A: No Harvest (No Action)	Alternative B: Harvest
WATER QUALITY, SOIL, FISHERIES, WEEDS:		
WATER QUALITY	Direct, indirect and cumulative effects evaluated were those associated with past management activities within the proposed Project Area. Direct, indirect, and cumulative effects within the project were observed to be minimal.	Proposed harvest activities and road construction have low to moderate risk of minor and temporary increased sediment during culvert installations. BMP's and erosion control mitigation measures would be implemented to prevent sediment delivery from roads to streams. Long term there would be an improvement in water quality and reduction in sediment at the replaced Union Creek crossing sites. No timber harvest would occur in SMZ's. There is low to moderate risk of direct, indirect, or cumulative effects.
WATER YIELD	There would be no potential for increases in water yield as a result of State activities.	There is low risk of direct, indirect, or cumulative effects from implementation of this alternative.
CUMULATIVE WATERSHED EFFECTS	Measurable cumulative effects from past management activities of poorly located roads with inadequate drainage on other ownerships would continue to occur (refer to existing conditions discussion). Cumulative effects are expected to decline as hydrologic recovery continues to occur.	The proposed harvest and road construction would present a low to moderate risk of cumulative impacts of increased sediment delivery by disturbing soil. The risk of cumulative effects from sediment delivery would be reduced or eliminated by using erosion control measures and crossing site improvements. There is a low risk of adverse impacts to downstream water quality and beneficial uses occurring as a result of the proposed project.
SOIL RESOURCES	Direct and indirect effects on soil resources would continue to occur, as road surface drainage within the Project Area would not be improved.	Tractor skidding could cause direct effect to soils that could result in increased erosion. Mitigation measures would maintain soil resources and minimize disturbance. Retention of slash and coarse woody debris would have a long-term beneficial effect to nutrient cycling, maintain long-term soil productivity and reduce on-site erosion.

COLD WATER FISHERIES	There would be no change of direct, indirect or cumulative impacts to fisheries. Habitat connectivity would continue to be partially restricted on parts of Union Creek.	There is a low risk of direct, indirect, or cumulative effects to cold-water fisheries associated with the proposed action. Direct effects are potential sediment delivery from road construction, maintenance, and soil disturbance. Mitigations to control sediment and application of erosion control measures would minimize disturbance. Because no harvest would occur in the SMZ's or RMZ's there would be no effect on large woody debris recruitment or stream shading. We expect there will be a long term benefit to Union Creek due to a reduction in current sediments from road drainage and stream channel instability at the crossing sites and improved fish habitat connectivity.
NOXIOUS WEEDS	There would be a gradual increase in noxious weed infestations over time. Integrated weed management efforts would continue on these lands, but with less funding than would be provided for as a result of the implementation of Harvest Alternative B.	Similar or slight increase in noxious weed density and occurrence, due to soil disturbance and decreased tree canopy. Integrated weed management efforts would continue throughout the Project Area. Control efforts would promote re-vegetation and emphasize treatment of any new noxious weeds. More Forest Improvement dollars would be available for weed control.
FOREST VEGITATION AND OLD GROWTH	Slow growth rates and mortality would continue in timber stands including those classed as Old Growth (Green et al 1992).	Vigor and growth rates of trees would improve within treated stands as a result of reduced stocking and retention of trees with best available crowns, health, vigor and form. Improved stand vigor and removal of insect infested trees would help prevent further mortality. Regeneration would add to stand structure by creating a new age class. Less dense stand conditions would improve growth and yield rates and decrease the risk of stand replacement fire. Short term (1-3 year) increased risk for surface fire spread due to slash accumulation.
AIR QUALITY	Log hauling from DNRC lands would not occur. No slash burning would occur.	There would be an increase in road dust, if logs were hauled from state lands under dry road conditions. Minimal direct and cumulative effect. A permit to burn slash would be obtained from the Smoke Monitoring Unit. Slash burning would occur in the fall, when burning is permitted. It is estimated that burning operations would be completed within a week. Minimal direct and cumulative effect.

ECONOMIC BENEFITS AND EXPECTED REVENUES	No economic contribution or benefits to the School Trusts would occur within the foreseeable future. This would have a direct effect upon the School Trust and DNRC's obligation to provide the School Trusts with income from Trust Lands.	The investment into the road infrastructure under this alternative would be approximately $5-6/ton (negative with respect to stumpage value). This investment would decrease future management costs. The forest improvement collections ($4.47/ ton; as of December, 2010) would be approximately $62,580-$93,870. This money would be deposited in the forest improvement fund to be used for thinning, prescribed burning, planting, weed management, and the management activities on Trust Lands. The projected revenue of this alternative for the School Trust is approximately $350,000-525,000 ($25/ ton). The proposed project would provide work for road-building contractors, logging contractors, their subcontractors, and their employees. The logs would likely be processed by local mills providing additional employment opportunities.
HISTORICAL AND ARCHAEOLOGICAL SITES	There is a low risk for direct, indirect or cumulative effects.	The DNRC archeologist made an assessment. There is no evidence that cultural resources are present. There is a low risk for direct, indirect or cumulative effects.

ENDANGERED SPECIES:		
GRIZZLY BEAR	Low risk of direct, indirect, or cumulative effects.	Low risk of direct, indirect, or cumulative effects.
LYNX	Short term cumulative effects to Lynx Habitat due to insect-induced mortality, with long term benefits through creation of Denning and Young Foraging Habitat.	Low risk of direct, indirect effects and cumulative effects.
SENSITIVE SPECIES:		
FLAMMULATED OWL	Low risk of direct, indirect, or cumulative effects	Low to moderate risk of direct and indirect effects. Low risk of cumulative effects.
PILEATED WOODPECKER	Low risk of direct, indirect, or cumulative effects	Low to moderate risk of direct and indirect effects. Low risk of cumulative effects.
FISHER	Low risk of direct, indirect, or cumulative effects	Low risk of direct, indirect, or cumulative effects.
BIG GAME:		
ELK	Low risk of direct, indirect, or cumulative effects	Low risk of direct, indirect, or cumulative effects.
OTHER SPECIES OF CONCERN:		
NORTHERN GOSHAWK	Low to moderate risk of direct, indirect, or cumulative effects.	Low to moderate direct and indirect effects to nesting habitat. Moderate risk of cumulative effects.
GREAT GRAY OWL	Low to moderate risk of direct, indirect, or cumulative effects.	Low to moderate direct and indirect effects to nesting habitat. Moderate risk of cumulative effects.

3.0 Affected Environment

Introduction

Chapter 3: Affected Environment succinctly describes the relevant resources that would be affected by the alternatives if they were implemented. This chapter also includes effects of past and ongoing management activities within the analysis area that might affect project implementation and operation.

This description of the existing environment in Chapter 3 establishes a baseline of comparison from which the activities of Alternative A: No Action (in Chapter 2), and the predicted effects of Alternative A: No Action (in Chapter 4), can be contrasted against the potential effects of Alternative B: Harvest (in Chapter 4).

3.1 Water

3.1.1 Water Quality-Analysis Methods & Area

The primary concerns relating to water resources within the analysis area are potential impacts to water quality from sediment sources on roads and forest sites that can deliver to stream channels as well as within the channels. In order to address these issues the following parameters are analyzed for each alternative:

- ◊ Miles of new road construction and road improvements
- ◊ Potential for sediment delivery to streams
- ◊ Potential for water yield increase impacts to stream channel stability

A watershed analysis and field survey was completed by a DNRC hydrologist for the proposed project to determine direct, indirect and cumulative effects to water quality. The water quality evaluation included a review of existing inventories for soils and water resources (NRIS 2010), road inventories, and reference to previous DNRC projects, and comparisons of aerial photos combined with GIS analysis to estimate the area of past timber harvest and vegetative recovery. Several field reviews were completed for the proposed harvest units, access roads and associated streams. Observations, information and data were integrated into the watershed analysis and design of project mitigations.

The analysis areas for sediment delivery are limited to the harvest units and roads used for hauling and will focus on the streams described as affected watersheds. This includes in-channel and upland sources of sediment that could result from this project. In-channel areas include the stream channels adjacent to and directly downstream of harvest areas. Upland sources include harvest units and roads that may contribute sediment delivery as a result of this project.

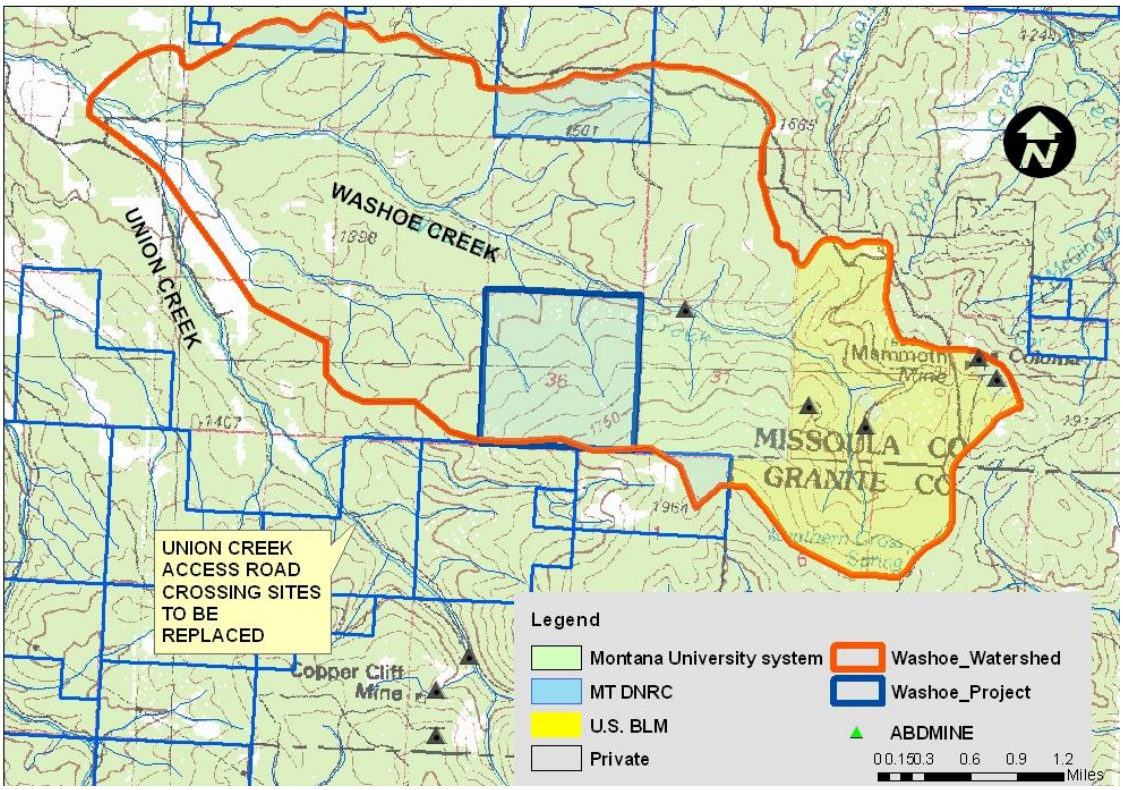
A DNRC hydrologist completed a coarse filter qualitative assessment of watershed conditions and cumulative effects as outlined in the Forest Management Rules (ARM 36.11.423) concerning watershed management. Based on extensive logging within the drainage in the past, a fine filter

assessment of sediment sources and stream channel conditions was also completed. The analysis areas for watershed cumulative effects considered the Washoe Creek watershed, and the Union Creek watershed affected by the access roads to the Project Area.

Analysis Areas

The proposed harvest would occur within DNRC Section 36, T13N, R15W, which is located in the Washoe Creek drainage about 6 miles southeast of Potomac, Montana (refer to project watershed map WS-1). The Washoe Creek watershed is 7,122 acres in size and the drainage is approximately 6.1 miles in length. Washoe Creek is a tributary to Union Creek, (HUC 17010231304 = 14,827 acres) which flows into the Blackfoot River. The focus of water resource analysis will be the Washoe Creek drainage from the headwaters to the mouth on Upper Union Creek, and the access haul roads in Union Creek watershed that includes a road that parallels and crosses Union Creek.

Map WS-1 DNRC Washoe Timber Sale Watershed Map



3.1.2 Water Quality Regulations and Beneficial Uses

The Washoe Creek drainage is classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.623). Waters classified B-1 are suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality must also be suitable for bathing, swimming and recreation; growth and propagation of salmonid fishes, and associated aquatic life, waterfowl and furbearers; and agricultural and

industrial water supply (ARM 17.30.623 (1&2)). Among other criteria for B-1 waters, no increases are allowed above naturally occurring concentrations of sediment, (except as permitted in 75-5-318, MCA) which will or are likely to create a nuisance or renders the waters harmful, detrimental or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife (ARM 17.30.623(2)(f)).

Naturally occurring includes resource conditions or materials present from runoff on developed land where all reasonable land, soil, and water conservation practices have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. The State has adopted Forestry Best Management Practices (BMP's) through its Nonpoint Source Management Plan as the principle means of controlling non-point source pollution from silvicultural activities. DNRC provides further protection of water quality and sensitive fish through implementation of the Streamside Management Zone (SMZ) Laws and Forest Management Rules.

Washoe Creek and Union Creek are listed as impaired on the State's 303(d) list of impaired bodies of water. Washoe Creek is listed as partially supporting cold water fisheries, aquatic life and primary contact recreation.

Probable causes are sedimentation, Chlorophyll-a, nutrients, nitrate, and phosphorus. Probable sources are mining, silviculture harvesting, agriculture and unknown sources. Total maximum daily loads (TMDL's), and measures to control those levels were developed for the Lower Blackfoot River including Washoe Creek and Union Creek (MTDEQ 2009) and are incorporated by reference. Sediment TMDL's were developed for Washoe Creek but nutrients were not. Excess fine sediment has been identified in Washoe Creek and Union Creek. All TMDL measures listed for the affected Project Area in the Lower Blackfoot River TMDL would be implemented with the proposed project.

Downstream beneficial uses in Washoe Creek include: domestic surface water rights, fisheries, irrigation, and livestock watering. Washoe Creek is not part of a municipal watershed.

All rules and regulations pertaining to the Streamside Management Zone (SMZ) Law would be followed. An SMZ width of 100 feet is required on Class I and II streams when the slope is greater than 35%. An SMZ width of 50 feet is required when the slope is less than 35%. No harvest is planned within SMZ's, or within the RMZ of Washoe Creek, the only Class 1 stream near the proposed harvest area.

All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management would be followed. This includes but is not limited to water quality (ARM 36.11.422); cumulative effects (36.11.423) Riparian Management Zones (ARM 36.11.425) and Fisheries (ARM 36.11.427).

As part of ARM 36.11.427(3)(a)(i) and (iv) and ARM 36.11.436, DNRC is committed to designing forest management activities to protect and maintain westslope cutthroat trout and all other sensitive fish and aquatic species. DNRC is a signatory to the 2007 (interagency) Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout.

3.1.3 Existing Conditions- Water Quality and Water Quantity

The proposed actions may affect water quality associated with sediment delivery to streams or use of the existing haul roads and crossings. The Washoe Creek watershed is 7,122 acres in size and the drainage is approximately 6.1 miles in length to the mouth on Upper Union Creek. The land ownership in the Washoe Creek drainage is mixed between private ownership (54%) the Bureau of Land Management (19%), DNRC (14%), Montana University Lands (13%) and several old mining prospects. In the fall of 2010, DNRC acquired lands along the haul route from The Nature Conservancy that were previously Plum Creek Timberlands.

The primary impact to Washoe Creek water quality is sediment and the suspected causes of impairment to water quality on Washoe Creek include historic mining, livestock grazing within the stream corridor, and timber harvesting. Historically there has been extensive timber harvest and roads in the Washoe Creek drainage, however, there are relatively few crossings of the mainstem due to the steep terrain in the mid to upper reaches. Historic roads in the drainage could be sources of sediment to Washoe Creek where there is close proximity of roads to the stream and inadequate road maintenance and surface drainage. There are 4 abandoned mines in the headwaters of Washoe Creek. An open pit barite mine that drains into headwaters of Washoe Creek has been identified as a source of sediment (http://cwaic.mt.gov/). The results of the sediment source assessment by MTDEQ indicate that stream bank erosion is a primary source of the controllable sediment load delivered to the creek. The lowermost Washoe channel (3/4 mi. up) was described as being composed of dogwoods, hawthorns, alders and grasses with channel incising in some areas and widening in others. Large woody debris abundance was described as being suboptimal on the lowermost channel. There was a moderate to high amount of fine sediments in both pools and riffles. Over-all the riparian vegetation looked good. Some lateral erosion was occurring but it was noted that this was natural and estimated to be in balance with the stream and its setting. Detrimental erosion was noted as only to be occurring at animal crossings. In lower Washoe Creek, low flow alterations are also suspected as a source of fine sediment accumulations in Washoe Creek (DEQ Reassessment of Washoe Creek 2004). Metals were not determined to be above standards.

This DNRC parcel is 640 acres located on northerly aspects in the upper ½ of the Washoe Creek drainage. The average annual precipitation in this parcel has a range of 20-25 inches which is mainly received as snow. Soils are well drained and surface runoff and overland flow are unlikely, except along drainages and on roads. The main stem stream channel of Washoe Creek is a class 1 stream that flows across the NE corner of the DNRC Section for about 175 feet. Washoe Creek supports westslope cutthroat trout which is assessed in the fisheries section. Stream channel stability rating is good on this short segment of stream due to recovery over time since upstream mining activities.

There are three intermittent drainages in the section that originate in the DNRC project section and flow towards Washoe Creek. Tributary 1 is located in the far west side of the section, it originates as a small spring and is a Class 2 segment with a narrow channel that goes subsurface in a rocky draw above the DNRC property line and does not deliver to Washoe Creek. A new dry draw crossing is proposed above the segment that has flow. Tributary 2 is near the midpoint of the section and has a short segment of Class 2 perennial flow that then goes subsurface, but may flow to Washoe Creek during spring runoff. Tributary 3 is in the east half of the section and has Class 2 perennial flow that also goes subsurface in a rocky draw. Two crossings are planned on tributary 3 to access the northeast corner of the section. All three tributaries have discontinuous minor flow and only portions of the draws have defined channels for the segments that remain wet. Livestock and wildlife use have resulted in low to moderate trampling of stream banks. There are two small isolated wetland sites, one in the northwest corner of the DNRC project section and one near the eastern boundary line that has been fenced. The forest stands planned for harvest have several age classes of trees with full canopy coverage. Lodgepole pine makes up approximately 11% of the forest stands and is dead, dying or at risk of pine beetle mortality and the canopy coverage is declining associated with the tree mortality.

Access roads and Union Creek Crossings: Roads within the project section are stable but require maintenance to restore road surface drainage. The proposed harvest areas on DNRC would be accessed by roads within the Camas Creek, Union Creek and Washoe Creek drainages. The main access road is open year round up Union Creek. Just east of the Union Creek crossing there is a gate that restricts motorized access seasonally, in the SW, SW, Section 2, T12N, R15W. DNRC has completed a road inventory and sediment source survey for the proposed harvest areas and roads. During our sediment source survey, it was found that road drainage has been installed to meet BMP's on most of the access road route, yet there are roads that have not been recently maintained, and that surface drainage was inadequate on many roads segments. Primary sediment source concerns on the access road were road surface drainage on the existing Union Creek crossing in Section 3 T12N, R15W and a tributary stream crossing that requires maintenance of road surface drainage. The existing road parallels Union Creek through the recently acquired DNRC land in section 3, 12N, R15W and through BLM ownership up to the Cliff mine site. Mining in the headwaters of Union Creek started in the late 1800's and has increased sediment from roads and placer operations. Sedimentation sources identified in the Union Creek drainage are: road-fill segments adjacent to stream channels, stream crossings with inadequate road surface drainage prior to the crossing sites, historic mining, historic riparian harvest and dispersed grazing use.

Timber harvest has occurred in the Washoe Creek drainage since the early 1900's associated with mining and area development. Most of the previous harvest has been partial cutting, leaving substantial residual forest cover. Based on aerial photos and site reviews the more extensive harvests and road

construction within Washoe Creek and the analysis area occurred between 1960 and the 1990's, which has allowed considerable re-growth and vegetative recovery.

A harvest history was developed for the Washoe Creek watershed from aerial photos to estimate the annual water yield increases for the watershed using Equivalent Clearcut Area (ECA) analysis (Haupt 1985). ECA is a procedure used to index the relationship between vegetative condition and water yields from forested watersheds. ECA is a function of; the total area that is roaded and harvested, the % crown removal in harvested areas, and the amount of vegetative growth recovery that has occurred in the harvested areas. The existing ECA is calculated as 1,041 acres and the allowable ECA is 1,696 acres before a threshold value of concern is exceeded. The current % water yield increase over a fully stocked forest condition is estimated at 8.2 %. After reviewing the beneficial uses, and existing watershed condition per ARM 36.11.423, a threshold of concern for water yield increase in the Washoe Creek watershed was set at a conservative 10% over a fully forested condition. Since Washoe Creek supports westslope cutthroat trout (WSCT) and is TMDL listed for sedimentation, a conservative WYI was estimated.

Older Lodgepole pine and a portion of ponderosa pine that are dead, dying and at risk of mountain pine beetle mortality comprise approximately 11% of stand volume in the proposed DNRC harvest areas. Within the Washoe Creek drainage the pine beetle mortality will have an effect on changes in available water, evapo-transpiration, but would be within the range of natural conditions and expected to have a minor change to water yield.

3.2 Geology and Soils

3.2.1 Geology and Soils Analysis Area & Methods

The analysis area for geology and soil resources includes the project sections and the access roads to the DNRC sections proposed for timber harvest. The soils analysis included an evaluation of Missoula County soil survey data, aerial photos, past harvest design and on-site field review by DNRC hydrologist/soil scientist for soil properties and current conditions to assess past and predicted effects compared with DNRC soil monitoring results on previous harvest operations.

3.2.2 Existing Conditions- Geology and Soils

The proposed harvest areas are located on the upper forested slopes of the Washoe Creek drainage in section 36, T13N, R15W. Parent materials are a mixture of shallow to deep, gravelly residual soils derived from mixed bedrocks of limestone, argillite and quartzite with surface deposit of tertiary clay along the access road and some midslopes terrain. There are several old mining claims in the headwaters of Washoe Creek, including the Coloma gold placer mine and barite mines that are not active or abandoned. There are several steep bedrock exposures in the NE corner of the section. While there may be mineral potential, there is no other especially unique or unstable geology in the Project Area.

Rock outcrops and shallow soils are common on ridgelines, yet most sites are common excavation or rippable. The fractured bedrock that is throughout the Project Area is very stable, resilient to erosion and has a high infiltration rate that generally exceeds precipitation rates. The existing forest access roads to the DNRC project parcels cross segments of higher clay content tertiary deposits on footslopes in the Potomac valley, that are prone to rutting if operated on when wet. Roads would require average drainage spacing and segments of ditching based on site specific conditions. With the exception of the narrow riparian areas adjacent to stream channels, the project sections are relatively dry mountain sideslopes which receive 20-25" of precipitation per year on average. The majority of the DNRC Project Area is located on moderate to steep slopes.

Soils of the Washoe Creek sale area are mainly gravelly loam residual soils on the mountain sideslopes with areas of heavy textured, silty clay loam, tertiary age sediments on the moderate slopes less than 30% in the NW ¼ of the section. Soil descriptions are generally described here and noted in table S-1 and on the appendix soil map.

The coarse textured, gravelly Evaro and Winkler soils are similar soils that are well drained and form good road materials. Winkler soils are moderately deep very gravelly loam soils forming in fractured bedrock and colluvium on 30-60 % sideslopes. Winkler soils in this area are somewhat excessively well drained and have high gravel content subsoils exceeding 50% volume. These coarse textured soils have a long season of use and are resilient to erosion. Winkler on southerly aspects (MU 131/134) and ridges has shallower surface soils, lower moisture retention and productivity. Northerly aspects (MU 133) have slightly deeper surface soils, moisture retention and productivity, supporting Ponderosa pine and Douglas-fir. There is a draw with short steep slopes in the east half of the project section with Winkler soils on 30-60 % slopes and common bedrock outcrops. High gravel content soils and drier sites on road cut and fill-slopes can be slow to re-vegetate, unless promptly reseeded.

Evaro soils located on northerly aspects in the Project Area are very gravelly silts loams that have a reddish volcanic ash, silt loam surface soil with gravelly subsoil and occur on north aspects and higher elevations in the area. These are moderate to high productivity soils and support Douglas-fir, Lodgepole pine and western larch. Both soils have a low potential for erosion on slopes < 45% which can be effectively controlled by limiting disturbance and standard drainage practices. Erosion potential is similar for these soils and moderate on short steep slopes> 45%. The main soil concern is soil displacement of the shallow topsoils, which are important for seedling establishment. Displacement potential for ground based operations is high for slopes over 45%. These limitations can be mitigated by reducing soil disturbance and limiting ground based operations to slopes less than 45% and cable harvest of slopes over 45%. Few soils related problems are expected on these soils.

Shooflin and Greenough soils are deep silt loams with clayey subsoils forming in tertiary age siltstone which occur along portions of the private access road and in the NW 1/4 of the section. The fertile Shooflin and Greenough

soils tend to remain moist late into spring and are susceptible to soil displacement, compaction , and road rutting if operated on when wet. Greenough soils have a moderate susceptibility for erosion and Shooflin soils are moderate to high. Material quality for road construction is limited by low soil strength, low gravel contents and slow water permeability. These limitations can be largely overcome by reducing soil disturbance, operating when soils are relatively dry frozen or snow covered and grading the roads. Spring operations and wet site crossings may require gravel surfacing based on field review.

On all forested sites there is currently moderate to high levels of existing forest floor coarse woody debris across the proposed harvest areas similar to expected range of historic conditions and consistent with levels established by Graham et al. (1994).

DNRC initially developed the road system in this section and completed regeneration harvest in 1989. Residual soils effects are minimal with few major skid trails still apparent on less than 10% of the old units, and the previous harvest units are stocked with young conifers. Historic skid trails were vegetated and no BMP restoration needs for past harvest areas were identified. Previous harvest sites across the project parcels are well regenerated to conifer species. The 1989 harvest sites would not be reentered with this proposed harvest entry.

Soil Interpretations Table S1 Washoe Timber Sale Section 36, T13N, R15W						
	Mapping Unit Name	**Soil Description**	**Erosion Potential**	**Displacement hazard**	**Compaction Hazard**	Notes
36	Evaro gravelly loam, 8 to 30 percent slopes	GrSilt Loam colluvium from argillites/qtz Volcanic ash Surface low clay content	Moderate K .17	Mod	Mod	Productive soils suited to larch and Douglas-fir. Avoid excessive disturbance of ash surface
37	Evaro gravelly loam, 30 to 60 percent slopes	Gr Silt Loam Colluvium from argillites / quartzite Volcanic ash Surface Low clay content	Moderate K .17	Mod to high on slopes >45%	Mod	Limit ground skid to slopes less than 45% Avoid excessive disturbance of ash surface
49	Greenough silt loam, 4 to 15 percent slopes	Silt loam, from tertiary siltstone. Low gravel content 18-32% clay subsoil	Moderate K .37	Mod	Prone to rutting and compaction if operated on when wet	Fine textured soils, productive. Remains wet in spring. Check soil moisture prior to operations
100	Shooflin silt and clay loam, 4 to 15 percent slopes	Deep Silt loam and clay from tertiary mudstone, low gravel content 60-80% clay subsoil	Mod/High K .49	Mod	Prone to rutting and compaction if operated on when wet	Clayey subsoil prone to rut. Moist productive soil. Remains wet in spring. Check soil moisture prior to operations
131	Winkler, very gravelly loams, 30 to 60 % slopes	Shallow-mod deep residuum & colluvium low clay content	Low, very coarse K .02	Mod to high on slopes >45%	Mod	Shallow-Mod depth soils with fractured rock at shallow depth, Limit ground skid to slopes less than 45%
133	Winkler gravelly loam, cool, 30 to 60 percent slopes	Shallow-mod deep residuum & colluvium low clay content	Low, very coarse K .02	Mod to high on slopes >45%	Mod	Shallow-Mod depth soils with fractured rock at shallow depth, northerly aspect cool and more productive than 131 .Limit ground skid to slopes less than 45%
134	Winkler-Rubbleland complex, 50 to 80 percent slopes	Shallow residuum & colluvium fractured rock outcrops common	Low, very coarse K .02	Mod to high on slopes >45%	Mod	Shallow-Mod depth soils with fractured rock at shallow depth, northerly aspect cool and more productive than 131 .Limit ground skid to slopes less than 45%

Erosion Factor **K** indicates the susceptibility of a soil to sheet and rill erosion and considers rock fragments.
K of .02 is low and .69 is highest

Soil Map S- 1 Washoe Timber Sale - Section 36, T13N, R15W

3.3 Fisheries

3.3.1 Fisheries Analysis, methods, and area

Fisheries resource concerns include: the proposed forest management actions may affect fisheries by changes in water quality, quantity or sedimentation and connectivity. These issues were evaluated by reviewing available resource inventories, completing field reviews of existing conditions and analyzing the anticipated effects of sediment delivery on fish habitat in the Project Area, and habitat connectivity as affected by road crossings along the proposed haul roads. No harvest or road construction operations are planned near Washoe or Union Creeks that would affect large woody debris, shading or stream temperature, and these concerns are dismissed from further analysis.

The analysis methods for sediment delivery will follow those used in the Hydrology portion of this report. The analysis areas for sediment delivery are limited to the harvest units and roads used for hauling and will focus on the streams described as affected watersheds. This includes in-channel and upland sources of sediment that could result from this project. All potential sediment sources identified as part of the existing condition are discussed in the Hydrology Analysis portion of this EA. The analysis area for stream connectivity includes the project haul routes and stream crossings. Expected effects to fisheries habitat will be addressed qualitatively using the current condition as a baseline in comparison to the expected changes due to the alternatives proposed.

Fisheries Cumulative Effects Analysis methods

The fisheries cumulative effects area analysis will focus on potentially affected water resources and fisheries streams associated with proposed harvest and road construction in Section 36, T13N, R15W and use of the existing access road crossings to known fisheries. The analysis area for sediment delivery is limited to the harvest units and roads used for hauling. This includes in-channel and upland sources of sediment that could result from this project.

3.3.2 Existing Condition- Fisheries

Washoe Creek is a second order stream that supports native westslope cutthroat trout (FWP-MFISH 2010) of high genetic purity. Westslope cutthroat trout is considered a sensitive species by DNRC (ARM 36.11.436). Washoe Creek and Union Creek provide spawning and rearing habitat for westslope cutthroat trout (WSCT). Washoe Creek and Upper Union Creek are not known to support bull trout. Washoe Creek provides fish habitat and connectivity to Union Creek WSCT fisheries. Moderate impairments to fisheries in lower Washoe Creek include sedimentation and bank impacts from excessive livestock access to stream banks and lack of in-stream complexity. There is only a short segment of about 175 feet of the main stem of Washoe Creek that flows through the NE corner of DNRC section 36 (refer to water quality section). No fish barriers or limitations to habitat connectivity were identified on the DNRC Project Area. No harvest or road construction is proposed near the SMZ or RMZ of Washoe Creek that could affect sediment, fish habitat, vegetative shading, stream temperature, large woody debris or stream complexity. The intermittent streams that drain the DNRC Project Section 36, T13N, R15W do not support fish and only one of the draws has intermittent spring runoff that has a low potential for flow to Washoe Creek.

Fisheries restoration planning has been to identify fisheries impairments on streams and promote the correction of habitat related limiting factors. The primary limiting factors to fish habitat is at the Union Creek crossing where connectivity is impacted by the crossing design and historic sediment impacts from roads, abandoned mines/placer activities and grazing. Based on a fisheries restoration priority ranking, Union Creek ranked moderate for interim restoration (FWP Pierce et al 2002b).

Washoe Creek is considered one of the lower priority streams for restoration in the Blackfoot drainage, due to limited public access for sport fishery, low native species value and potential to improve downstream water quality (Blackfoot Challenge 2003). No restoration projects have been proposed.

Union Creek is impacted by flow alterations, habitat alterations, siltation, mine wastes and thermal modifications in the lower reach from 0.5 to 7 miles upstream. Probable sources are agriculture, grazing, abandoned mining, hydro modification, and other. Union Creek is considered one of the moderate priority streams for restoration in the Blackfoot drainage, due to limited public access for sport fishery, low native species value and potential to improve downstream water quality (Blackfoot Challenge 2003). Along the haul route, two stream

crossings in section 3, T13N, R15W on Union Creek were identified as limiting habitat connectivity for WSCT for approximately 1.25 upstream to an obvious fish passage barrier on a road crossing in Section 11, T12N, R15W near the Copper Cliff Mine.

3.4 Noxious Weeds

3.4.1 Noxious Weeds- Existing Conditions

Noxious weeds occurring in the project parcels are mostly knapweed (Centaurea maculosa), houndstongue (Cynoglossum officinale L) and spot infestations of thistle (Cirsium arvense) within project sections and on adjacent lands. Knapweed (Centaurea maculosa) was found along roadsides as well as in some forested portions of the Project Area. Houndstongue was found mostly along roadsides along the access haul route. Historic cattle grazing, timber harvest activities, and recreational uses, are most likely the reasons for the existing rate of spread of noxious weeds and the potential future spread and introduction of noxious weeds. Previous weed management treatments in the area have been limited to reseeding of some road cuts and The Nature Conservancy recently completed herbicide and biocontrol measures on roadsides and selected sites. Overall impacts of noxious weeds within the project areas are moderate. Weeds have spread through the drainage across ownerships over time mainly along roadsides and open forest sites with multiple uses and by seed dispersal from wind, traffic and wildlife. Timber harvest throughout these drainages has increased grass growth and the risk for noxious weeds to spread though ground disturbance.

3.5 Forest Vegetation- Existing Conditions

Through the emulation of natural processes the DNRC endeavors to manage for biologically diverse forests (ARM 36.11.405).

Prior to effective fire suppression, fire was one of the most dynamic forces shaping and maintaining forested landscapes. Natural disturbances such as fire occurred and Native Americans used fire intentionally and inadvertently to shape their environment.

The following analysis will use the assumption that forest conditions prior to Euro-American settlement, were "natural". On Missoula Unit and within the Project Area forest stand conditions are to some extent dissimilar to what was typical historically (pre-settlement, generally prior to 1900). Pre-settlement or historic conditions will be used herein as a baseline of comparison to the forest conditions currently. Current conditions will be compared to historic conditions with respect to cover types, age class distributions, and Fire Groups (the corresponding effects of fire on forests within various Habitat Types under various disturbance regimes).

Effective fire suppression has led to the establishment of dense regeneration, with a higher proportion of the more shade tolerant species such as Douglas-fir and subalpine fir.

With the absence of fire, forests can become overstocked and stagnated. Fuel accumulations increase as trees die from competition and environmental stresses. Overstocking and the associated stress due to competition between the trees for moisture and nutrients can lead to increased attack by insects such as the mountain pine beetle, pine engraver beetle and Douglas-fir beetle. The development of an understory of Douglas-fir and or subalpine fir forms a very effective fuel ladder that enables a surface fire to climb into the crowns of the larger overstory trees and kill them. High fuel loadings and dense stand conditions have led to high intensity, stand replacing wildfire in stands where they were uncommon in the past (Arno and Brown 1991).

A forest's response to fire is dependant on various forest attributes (stand age, structure, size class, stocking, and species composition), within the context of various environmental conditions. When a fire starts, it is fuels, weather and topography (including but not limited to: temperature, humidity, fuel load, fuel moisture, wind, elevation, slope, aspect etc), that determines how a particular forest condition is affected. Figure 1 shows the relative resistance of conifers to fire. Seral (shade intolerant species) are generally more resistant to fire effects.

Figure 1: Relative Degree of Resistance to Fire

Most resistant	Very resistant	Medium	Low	Very low
Western larch	Ponderosa pine Douglas-fir	Grand fir Lodgepole pine Western white pine Western redcedar	Spruce Hemlock	Subalpine fir

The Habitat Types (h.t.) in the Project Area for the most part belong to Fire Groups 6 and 9 as defined by Fischer and Bradley (1987), (86% and 14% of the Project Area, respectively). For Fire group 6 Douglas-fir is the indicated climax species.

The following descriptions of Fire Groups are those of Fisher and Bradley (1987).

For forests in fire group 6, Douglas-fir is both the indicated climax species and a vigorous member of the seral (shade intolerant species) component. It is not uncommon for Douglas-fir to dominate all stages of succession. Ponderosa pine, western larch, and lodgepole pine, where they occur are seral components whose abundance varies by phase. Fire history studies conducted within the PSME/CARU h.t. of Southwestern Montana indicate a mean fire interval of 42 years, for pre-settlement stands. Fire was an important agent in controlling density and species composition. Low to moderate severity fire converted dense stands of pole-sized or larger tress to a more open condition, and subsequent light burning maintained stands in open conditions. Frequent low intensity or moderate fires favored western larch and ponderosa pine over Douglas-fir where these species occurred. Severe fires probably occurred on sites with ladder fuels (seedlings and saplings that allow surface fires to move up into the overstory canopy), dense stand conditions, and heavy fuel loads that resulted in stand replacement. Stand replacement fires favored lodgepole pine on sites where this species was present. Fire's role as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression (unless corresponding fuel reduction occurs). The theoretical climax condition for Group Six is a multistoried Douglas-fir stand, although a fire-maintained open forest condition was the normal situation during the pre-settlement period. Frequent low to moderate severity fires that occur in the climax conditions on these sites, will create a more open, park-like stand of Douglas-fir, whereas a severe fire returns the stand to the grass, shrub and forbs stage (Fischer and Bradly 1987).

Table 3-2 shows that within the Project Area (640 acres), currently 13% of the area (82 acres) is the Douglas-fir cover type (19% for timber stands). Within this type there are 5 stands, 3 of which have a trace (less than < 10%) of ponderosa pine, the remainder have a representation of lodgepole pine.

The general pattern of forest succession for fire group 9 (14% of the Project Area) is as follows. Douglas-fir, lodgepole pine, and western larch are seral components, whereas subalpine fir, spruce and to a lesser extent mountain hemlock are the climax species (shade tolerant) associated with these fire groups. Fisher and Bradly found that the mean fire return interval for fire group 9 was approximately 90-130 years (Fischer and Bradly 1987). Forested stands experienced mixed severity fire effects, where some or all trees were killed by fire. As a result a variety of stand conditions were likely to occur throughout the range of these fire types.

Multi-storied mixed conifer forests, and western larch/ Douglas-fir forests, and fire maintained lodgepole pine stands are common for these fire groups. Reoccurring stand replacement fires favored the regeneration of lodgepole pine on sites where this species was present. Multi-storied mixed conifer stands are vulnerable to severe fire effects because of the potential high fuel loading and the increased presence of shade tolerant ladder fuels. Climax stands within fire group 9 are very susceptible to stand replacement fire.

Fire's role as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression, unless corresponding fuel reduction occurs. High fuel loadings and dense stand conditions have led to high intensity, stand replacing wildfire in stands where they were uncommon in the past (Arno and Brown 1991).

***The source of Data for the following tables is Stand Level Inventory (SLI) 8/4/08**

Table 3-1: Missoula Unit Cover Types that are not in Appropriate Cover Types*		
Cover Current	Number of Stands	ACRES
Sub-alpine fir	50	1,478
Douglas-fir	240	5,913
Lodgepole pine	50	1,200
Mixed Conifer	111	3,750
Non Stocked	150	5,092
W. Larch/Douglas-fir	212	6,058
Ponderosa pine	82	1,890
Western hemlock	10	435
Western white pine	2	35
Cover Appropriate	Number of Stands	ACRES
Douglas-fir	46	1,150
Lodgepole pine	32	837
Sub-alpine fir	10	887
Ponderosa pine	572	16,157
W. Larch/Douglas-fir	219	5,687
Western hemlock	4	107
Western white pine	10	231

Table 3-1 shows that on Missoula Unit there are 5,687 acres of the WL/DF cover type and 1,150 acres of the DF cover type that currently not in an "appropriate" condition (defined in ARM 36.11.405) (as the Stand Level Inventory (DNRC) model suggests would be appropriate). Additionally the upper portion of Table 3-1 shows that for these stands that are in an inappropriate condition, 1,478 acres are currently classified in the subalpine fir cover type (AF) and that 3,750 acres are in the mixed conifer (MC) cover type class. Essentially what this suggests is that within these stands there is a disproportionately greater number of shade tolerant species (currently) than shade intolerant species. This may suggest that there has been a cover type shift as a result of lack of disturbance, such as fire. Fire suppression and lack of disturbance has allowed these stands to move towards a climax condition where shade tolerant species are likely to perpetuate on the site. Stands such as these are at risk to stand replacement fire and insect attack as mentioned above. Left alone (as a result of fire suppression and a lack of disturbance) these stands would move towards a climax condition where the shade intolerant, fire dependant species (western larch, ponderosa pine, lodgepole pine) would be replaced.

Table 3-6 shows that within the Project Area there are approximately 23 acres of forest that should be the Douglas-fir cover type and approximately 128 acres that should be the

Western larch/Douglas-fir cover type and that they are currently in a cover type condition that is not appropriate. Of the aforementioned acres currently 67 acres are in a condition that is classed as sub-alpine fir cover type and 84 acres are classed as mixed conifer cover type. For the acres that currently are not in an appropriate condition, they have a proportionately high sub-alpine fir component. Essentially what this suggests is that within these stands there is a disproportionate number of shade tolerant species (currently) than shade intolerant species. This acreage (151 acres) when compared to the total acres in the Project Area (640 acres) represents 23 percent of the Project Area, comprised of stands ≥40 years. This 23 percent represents a cover type shift (species composition shift) that is a result of lack of disturbance, such as fire. There are 77 acres of 0-39 year age class (sapling stands) that are not in an appropriate cover type condition that are classed as sub-alpine fir. The estimates for this sapling stand indicated a greater proportion of sub-alpine fir to Douglas-fir and Western Larch saplings, than the Stand Level Inventory (DNRC) model suggests would be appropriate. However it is not uncommon for stands of this forest type to initially have a high proportion of sub-alpine fir, which occurs as advanced regeneration and was likely present prior to the 1989 harvest. For all aged stands within the Project Area 35 % are in a condition that is not appropriate. This may be a result of fire suppression.

Table 3-2: Current Cover Types within the Project Area*

Cover Type	Stands	Acres	Percent of acres
Douglas-fir	4	82	13%
Lodgepole pine	1	32	5%
Western larch/Douglas-fir	2	53	8%
Ponderosa pine	8	243	38%
Sub-alpine fir	3	146	23%
Total	20	640	100%

Table 3-3: Missoula Unit Age Class Distribution*

AGE CLASS	COUNT	ACRE	PERCENT
000-039	345	9,042	13%
040-099	644	17,854	26%
100-149	834	24,645	35%
OLD STAND (150+)	533	14,660	21%
Non Forest	97	3,783	5%

Table 3-4: Age Class Distributions (SLI 2008)*					
Project Area			**Proposed Harvest**		
AGE CLASS	Percent	ACRE	AGE CLASS	Percent	ACRE
000-039	32%	204	000-039	0	0
040-099	3%	18	040-099	5%	18
150+	50%	323	150+	84%	289
OLD GROWTH	15%	95~	OLD GROWTH	11%	38~
Total	100%	640	Total	100%	345

~ Within the Project Area approximately 80 acres were found to meet Green et al criteria for Old Growth when stratified and sampled as per SLI protocol; as compared to 95 acre SLI estimate.

Table 3-5: Age Class distributions for Missoula Unit* and Climatic Section M332B Bitterroot/Blackfoot (Losensky, 1997) by Percent of area				
Missoula Unit	**Age Class**			**Bitterroot/Blackfoot**
6 %	Non Forest or no age data available (<1%)			6 % nonstocked
13 %	0-39	SLI	Losensky 1-40	23 %
25 %	40-99		41-100	29 %
35 %	100-149		101-Var.Yrs	21 %
21 %	Old		141+	21 %

Losensky's report: "Historical Vegetation of Montana" 1997, summarized United States Forest Service (USFS) inventory data dating back to the 1930's. From this data some extrapolations were made so as to quantify historic forest conditions by back dating to 1900, which generally would reflect stand conditions at the time of Euro-American arrival (Losensky 1997).

Table 3-5 illustrates that on Missoula Unit there is more mature (100-old and Old) forest than what Losensky found to be the condition historically. Additionally, Table 3-5 shows much less 0-39 year old stands on Missoula Unit than Losensky found. This suggests that there may have been a shift in age class distributions as a result of fire suppression (lack of disturbance), when compared to what was the age class distribution was historically. Table 3-4 shows a disproportionate amount of stands in the 150+ age class within the Project Area (50%) as compared to historic conditions reported by Losensky

Table 3-5A: Garnet Analysis Area Age Class Distribution 2008 SLI			
AGE CLASS	COUNT	SUM_ACRES	Percent Area
000-039	116	2,862	13%
040-099	203	5,902	28%
100-149	188	6,346	30%
Old Stand	188	5,554	26%
Non-forest	18	724	3%
Total	713	21,388	100%

(21% Table 3-5).

The Garnet Analysis Area (GAA) is that portion of Missoula Unit (DNRC Trust Lands) East of the confluence of the Blackfoot River and the Clark Fork River including the area between these two rivers. Table 3-5A shows the age class distribution for DNRC/Missoula Unit within the Garnet Analysis Area. When a comparison is made between the Project Area and the Garnet Analysis Area, there is a greater amount of Old Stands within the Project Area (approximately 65%) compared to 26% in the Garnet Analysis Area. Additionally, there is approximately two and a half times the proportion in area (32% compared to 13% respectively) of 0-39 year old stands within the Project Area compared to the Garnet Analysis Area. Losensky reported almost two times (1.7) the area of young stands (1-40 years) as there are currently within the Garnet Analysis area and less area occupied by 100-149 and Old Stands. The comparison of the Garnet Analysis Area to what Losensky reported would suggest a change in age class distributions that could be attributed to a lack of disturbance, such as fire or other agents. Even aged stands comprise 32% and multi storied structures 68% (Table 3-7), within the Project Area.

Table 3-6: Project Area Forested Cover Types where the Current Cover is Not Equal to the Appropriate Cover Type (SLI 2008; does not include stands < 40 years old))

Cover Type	Appropriately Acres	Currently Acres	Difference Acres
Western larch/Douglas-fir or Douglas-fir	267	0	-267
Mixed conifer	0	84	+84
Sub-alpine fir	0	67	+67
Lodgepole pine	0	32	+32

Table 3-7: Project Area Forest Structure (SLI 2006)

Structure Type	# of Stands	Net acres	% Project Area
Single Storied	6	204	32
Multi-Storied	14	436	68
Total	20	640	100

Table 3-4 shows that within the Project Area there are 323 acres of timber stands 150+ years and possibly 95 acres of Old Growth within the Project Area (2008 SLI estimate). The proposed harvest would enter approximately 89% of those stands classed 150+ (approximately 289 acres) and enter 47% (38 acres) of the available Old Growth. The DNRC has adopted the Green et al 1992 definition of Old Growth (ARM 36.11.403). For the habitat types and cover types within the Project Area, the minimum Old Growth (Green et al 1992) criteria are as follows: for the Western Larch and Douglas-fir cover types there needs to be a minimum of 10 trees per acre (tpa) ≥ to 17" or a minimum of 8 trees per acre ≥21" inches (dependant on Habitat Type Group) in diameter at breast height (dbh) and these trees must be ≥ to 180 years old. For the lodgepole pine cover type there needs to be a minimum of 10 tpa ≥13" dbh that are ≥140 years old. The 2008 SLI estimates that there is possibly 95 acres within the Project Area that meet the Green et al definition for Old Growth. Stands classed as ≥150 years within the Project Area were stratified and sampled as per SLI protocol in July 2006. This survey estimated that within the Project Area approximately 80 acres meet the Green et al criteria. These

stands are of the Douglas-fir and Western Larch/ Douglas-fir cover types, and represent approximately 12% of the Project Area. SLI estimates of the total crown cover density for timber stands within the Project Area are 13% medium stocked and 87% well stocked. SLI protocol assigns stands having 40-69% crown cover as Medium stocked and stands with 70-100% crown cover density as Well stocked. The remaining sapling stands (classed 0-39 years, approximately 208 acres clear-cut in 1989) within the Project Area are estimated to be in a medium or well-stocked condition, comprising approximately 32% of the Project Area for both stocking classes combined.
The combination of drought conditions since 2000 and overstocked mature to over mature timber stands has caused insect attack throughout the Project Area. The Douglas-fir beetle has caused mortality within mature-old stands for close to a decade and salvage occurred on a few acres within the S1/2, S1/2 of the Project Section. Mountain pine beetle has caused mortality in the majority of the Lodgepole pine component of mixed conifer stands in the NE1/4 and NE1/4 of the SE1/4 of the project section. Mortality of Ponderosa pine has occurred within the NW1/4 of the Project Area, resulting from insect attack of Mountain pine beetle and Western pine beetle as recently as 2010.

3.6 Air Quality

3.6.1 Characteristics of Smoke in the Potomac Valley

The Project Area is located approximately 6 miles southeast of Potomac. The mountain valleys of Western Montana are prone to cold air inversions in the fall and winter when stationary high-pressure systems create a stable air mass that traps pollutants in the valley bottom. During the spring season the atmosphere is much more unstable and stable cold air does not settle into the valleys to the extent it does in the fall or winter. Due to this atmospheric instability, smoke is transported out of the valley much better in the spring than in the fall. (Turah Creek EA, MT DNRC 2002)

3.6.2 Regulation of Open Burning

Missoula County is a PM-10 Non-Attainment area as designated by the Environmental Protection Agency and the Montana Department of Environmental Quality. Open burning is allowed in Missoula County from March 1 to August 30 of each year. From September 1 to November 30 burning is permitted for forestry purposes only. No burning is allowed from December 1 to February 28. The Montana DNRC is a member of the Montana-Idaho Smoke Management Group. This group is composed of the major forestry burners in Idaho and Montana. Members of the group report their planned burns to a monitoring unit in Missoula before they are ignited. The goal of the smoke monitoring unit is to prevent the average PM-10 level for a 24 hour period from exceeding 50 milligrams per cubic meter of air. Idaho and Montana are divided into “airsheds” which are geographic areas with similar topography and weather patterns. Urban areas within these airsheds are designated as impact zones. Due to the potential for adverse impacts to air quality in urban areas, burning in these impacts zones is much more restrictive than the airshed it is located

in as a whole. The Project Area is located in Airshed 3A as designated by the Montana/Idaho Airshed Group. The Montana/Idaho Airshed Group Monitoring Unit issues daily smoke dispersion forecasts and burning restrictions for each airshed and impact zone. Restrictions are based on the number of burns planned, their location and atmospheric conditions. These restrictions are designed to limit the adverse impact to air quality resulting from prescribed burning. (Turah Creek EA, MT DNRC 2002)

3.6.3 Road Dust

The use of unpaved roads can produce dust when road surfaces are dry. There has historically been log truck and mining activity related traffic on the Garnet Range Road and including other roads within the Project Area. Traffic associated with activities on private timberlands, Bureau of Land Management ownership, DNRC Lands and Lubrecht State Forest Lands all have the potential to generate dust. Dust is presently produced by log trucks and passenger vehicle traffic along roads that would be used for log hauling purposes associated with this project

The DNRC (2004) scoped adjacent landowners and residents along potential access roads in the Union Creek, Washoe Creek drainages (Hole-in-the-Wall Road and Washoe Road) and Garnet Range Road. No comments were received from residents near the Garnet Range Road regarding truck speeds or dust. I (Project Leader) spoke (telephone conversations) with two residents who live along Washoe Road. They expressed concerns regarding maintaining the graveled surface of Washoe Road and potential dust resulting from road use associated with proposed Timber Sale activities. The DNRC is concerned that as a result of the use of Washoe Road that speed and dust would be a concern to local residents. Several residences are close to Washoe Road. Should the DNRC choose to use Washoe Road, dust mitigations would be addressed in the Timber Sale Contract.

Residents along this route (Washoe Road and Hole-in-the Wall Road and Union Creek Ranch) were scoped again in August of 2009, regarding the use of this route, no additional comments were received.

In April 2010 the DNRC scoped residents along Swanson Lane and Potomac Road, soliciting comments should this route be used to haul forest products. Potomac Road is paved and Swanson Lane is paved to the junction with Camas Road (which extends to the East away from Camas Creek). Missoula County maintains approximately a quarter mile of Swanson Lane past the aforementioned junction.

The haul route proposed would utilize the unpaved portion of Swanson Lane. Several residents live along the proposed haul route. One comment was received addressing the need to maintain the native surface of Swanson Lane should it be used by the DNRC to haul timber products. No comments where received regarding dust as an issue from residents along Swanson Lane and Potomac Road.

3.7 Recreational Use

Visitors to Garnet Ghost Town, travel the road up Bear Gulch and the Garnet Range Road (paved the first 3 miles and closed to passenger vehicles from December 1 to May 1, each year). Snowmobile use is common on and along the Garnet Range Road and is part of the Bureau of Land Management's Garnet Winter Recreational Trails System. Hunting is another common and traditional use of lands in the Garnets and within the Project Area; although motorized access to the Washoe Creek Section is restricted (October15-May 15). There is a gate east of Union Creek in Section 2, T12N, R15W that restricts motorized access (October15-May 15) to within approximately 1 mile of the south boundary of the DNRC Washoe Creek Section. Walk-in hunting is allowed on DNRC's Washoe Section. There exists another gate in Section 32, T13N, R14W (just east of Washoe Creek, just west of the Garnet Range Road), that restricts access to the east side of the DNRC Washoe Creek Section. The gate is approximately 1 1/4 miles east of the DNRC Washoe Section, and walk-in hunters would need to traverse the existing road across Lubrecht's Section 31, T13N, R14W were the road ends approximately ¼ from the east boundary of DNRC's Washoe Section. Private land bordering the west and north sides of the DNRC Washoe Creek Section excludes public access on the Union Creek side and to Washoe Creek along the north.

3.8 Economics

Table 3-8: Revenue/ Cost Ratios

	FY 2007	FY 2008	FY 2009	FY 2010
State	1.79	2.50	1.88	1.63
NWLO	2.32	3.07	3.20	2.85
SWLO	2.12	4.05	1.72	1.78

Table 3-8 illustrates an annual cash flow analysis conducted on the DNRC trust land forest management program for the fiscal years 2007 - 2010. Revenues and costs are monitored at the land office and statewide program levels. Revenue-cost ratios (R/C) are a measure of annual program cash flows comparing revenues earned, and expenses charged within the fiscal year accounting period.

Table 3-9: FY 2010 Forest Management Operations Summary

	Revenues	Expenses	Net Income	R/C Ratio	FI Collections	FI Expenses
State	$8,044,850	$4,943,408	$3,101,442	1.63	$1,205,781	$1,613,731
CLO	$128,035	$199,649	-$71,614	0.64	$44,415	$10,879
ELO	$0	$16,282	-$16,282	0.00	$0	$0
NELO	$38,840	$47,581	-$8,741	0.82	$1,596	$0
NWLO	$5,787,034	$2,027,219	$3,759,815	2.85	$798,708	$565,950
SLO	$0	$0	$0	0.00	$600	$0
SWLO	$1,763,856	$990,008	$773,848	1.78	$360,461	$259,668

Table 3-9 shows the FY 2010 annual summary of revenue and costs for the trust land forest management program. Values in this table represent a fiscal analysis not an economic analysis. This is because forest management revenues are earned multiple years after sales are planned, prepared and contractually executed, hence revenues and costs are not operationally relative in one given fiscal year.

Table 3-9 presents total costs and revenues by land office and for the statewide program in total. The overall revenue-cost ratio statewide is 1.63 in FY 2010, the lowest in the last four years. This current low program revenue-to-cost ratio is a product of increased program expenses due to the accounting movement of FI personal services into the main forest management program. On the revenue side, timber sale bid prices have decreased significantly due to structural changes in the U.S. housing and home construction markets. Reduced demand for timber resources has consequently lowered the overall forest management revenues.

3.9 Visual Quality

In 1989 approximately 208 acres were clear-cut within the Project Area. Far views defined herein are views of the Washoe Section 36, T13N, R15W, that are visible from vantage points other than those within the Project Area. The distribution of, and abrupt edges associated with the clear cuts are such that the harvest pattern does not appear to be natural and is noticeable when traveling east bound (looking ESE) along Highway 200 near Potomac. Although these cuts are regenerated, when viewed from a distance they still visibly contrast with the un-cut area. The view (from afar) of the 1989 clear cuts is most pronounced in winter; as clear cut areas provide less snow intercept and have less crown density than forested areas. Thus, it is when there is snow in the clear-cut areas that there is potentially the greatest visual contrast with un-cut forested areas. Snow does at times accumulate in the crowns of forested areas diminishing contrast between harvested and un-harvested areas.

3.10 Wildlife

3.10.1 Endangered Species

3.10.1.1 Grizzly Bears (Federally threatened)

Grizzly bears are listed as federally threatened under the Endangered Species Act, and are the largest terrestrial predators in North America, feasting upon deer, rodents, fish, roots and berries, as well as a wide assortment of vegetation (Hewitt and Robbins 1996). Depending upon climate, abundance of food, and cover distribution, home ranges for male grizzly bears in northwest Montana can range from 60 - 500 mi^2 (Waller and Mace 1997). The search for food drives grizzly bear movement, with bears moving from low elevations in spring to higher elevations in fall, as fruits ripen throughout the year. However, in their pursuit of food, grizzly bears can be negatively impacted through open roads (Kasworm and Manley 1990). Such impacts are manifested through habitat avoidance, poaching, and vehicle collisions.

The Project Area is approximately 20 miles southeast of the Northern Continental Divide Ecosystem grizzly bear recovery area, and approximately 4 miles southwest of occupied grizzly bear habitat (Wittinger et al. 2002). The nearby Anderson Hill has had repeated grizzly bear activity in recent years; and several grizzly bears have been documented in the Cramer Creek area to the south in recent years (J. Jonkel, MT FWP, personal communication, 2006; M. McGrath, MT DNRC, personal observation, 2005). Thus, the proposed Project Area may be part of one or more grizzly bear home ranges. Therefore, the cumulative effects analysis area for grizzly bears encompasses 166 square miles (106,269 acres), including the BLM roadless area and portions of the Blackfoot River corridor.

Grizzly bears are known to be more vulnerable to human interaction in areas with high open road densities or ineffective road closures. Currently there are 3.92 miles of open road per square mile (simple linear calculation; 651 miles of open road), and 4.88 total miles of road per square mile (810 miles of road), within the 166 square mile analysis area. Within the Project Area, there are no open roads, and approximately 4.55 miles of total road per square mile (simple linear calculation).

3.10.1.2 Lynx (Federally threatened)

Lynx are currently classified as threatened in Montana under the Endangered Species Act. In North America, lynx distribution and abundance is strongly correlated with snowshoe hares, their primary prey. Consequently, lynx foraging habitat follows the predominant snowshoe hare habitat, subalpine fir, Engelmann spruce, and grand fir forest (Maletzke et al. 2008). For denning sites, the primary component appears to be large woody debris, in the form of either down logs or root wads

(Squires and Laurion 2000, Mowat et al. 2000, Koehler 1990). These den sites may be located in regenerating stands that are >20 years post-disturbance, or in mature conifer stands (Ruediger et al. 2000, Koehler 1990).

Elevation within the Project Area ranges between 4760 and 6000 feet. The terrain is flat to moderately sloped, with approximately 78 acres of mature foraging habitat, 34 acres of temporary non-habitat, and approximately 189 acres of "other" lynx habitat (i.e., lands in lynx habitat that do not meet definitions for young or mature foraging, denning, or temporary non-lynx habitat, but serve to provide cover to facilitate movement and acquisition of alternative prey species); conditions which are utilized by lynx for foraging (Koehler et al. 2008). The Project Area likely receives use by lynx from the Garnet population, with winter track surveys indicating use adjacent to the Project Area (Squires et al. 2004). The cumulative effects analysis area is approximately 90,865 acres and is comprised of much of the habitat utilized by the Garnet lynx population (Squires et al. 2004). Within the analysis area, there are 27 School Trust parcels that contain approximately 3,320 acres of lynx habitat, of which, approximately 659 acres are in temporary non-foraging habitat (SLI database 20100324 release). Of these parcels, eight have current or recent timber sales (Lost Bear Timber Sale Environmental Analysis, Haywire Wallace Timber Sale Environmental Analysis, Dry Bearmouth Timber Sale Environmental Analysis). Additionally, the analysis area is experiencing an epidemic infestation of both mountain pine beetles, which attack lodgepole pine and Ponderosa pine, and western spruce budworm, which defoliates Douglas-fir, all true firs, spruce and western larch. The 2009 aerial detection survey indicated that approximately 49,433 acres (54%) of the analysis area had been affected by the mountain pine beetle, and approximately 36,758 acres (40%) of the analysis area had been affected by the western spruce budworm. Combined, these two forest insects can affect lynx mature foraging and denning habitat through killing overstory lodgepole pine and defoliating understory Engelmann spruce, Douglas-fir, and subalpine fir trees.

3.10.2 Sensitive Species

3.10.2.1 Flammulated Owls

The flammulated owl is a tiny forest owl that inhabits warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States and is a secondary cavity nester. Nest trees in 2 Oregon studies were 22-28 inches dbh (McCallum 1994). Habitats used have open to moderate canopy closure (30 to 50%) with at least 2 canopy layers, and are often adjacent to small clearings. It subsists primarily on insects and is considered a sensitive species in Montana. Periodic underburns may contribute to increasing habitat suitability for flammulated owls because low intensity fires would reduce understory density of seedlings and

saplings, while periodically stimulating shrub growth. Within the Project Area, there are approximately 338 acres of flammulated owl preferred habitat types, of which, approximately 249 acres may be suitable for use by this species.

3.10.2.2 Pileated Woodpeckers

The pileated woodpecker is one of the largest woodpeckers in North America (15-19 inches in length), feeding primarily on carpenter ants (*Camponotus* spp.) and woodboring beetle larvae (Bull and Jackson 1995). The pileated woodpecker nests and roosts in larger diameter snags, typically in mature to old-growth forest stands ((McClelland 1979), (Bull et al. 1992), (McClelland et al. 1979). Due primarily to its large size, pileated woodpeckers require nest snags averaging 29 inches dbh, but have been known to nest in snags as small as 15 inches dbh in Montana (McClelland 1979). Pairs of pileated woodpeckers excavate 2-3 snags for potential nesting sites each year (Bull and Jackson 1995). Snags used for roosting are slightly smaller, averaging 27 inches dbh (Bull et al. 1992). Overall, McClelland (1979) found pileated woodpeckers to nest and roost primarily in western larch, ponderosa pine, and black cottonwood. The primary prey of pileated woodpeckers, carpenter ants, tend to prefer western larch logs with a large end diameter greater than 20 inches (Torgersen and Bull 1995). Thus, pileated woodpeckers generally prefer western larch and ponderosa pine snags > 15 inches dbh for nesting and roosting, and would likely feed on downed larch logs with a large end diameter greater than 20 inches.

The Project Area is a mixture of Douglas-fir/dwarf huckleberry and subalpine fir/dwarf huckleberry habitat types, with approximately 201 acres having an average stand diameter $\geq$ 15 inches dbh (Stand Level Inventory database). Additionally, the current available habitat has been affected by mountain pine beetles. Within the forested areas of the Project Area, canopy closure is generally in excess of 50%. The cumulative effects analysis area encompasses a 1-mile radius surrounding the Project Area.

3.10.2.3 Fisher

The fisher is a medium-sized animal belonging to the weasel family. Fishers prefer dense, lowland spruce-fir forests with high canopy closure, and avoid forests with little overhead cover and open areas (Powell 1978, Powell 1977, Kelly 1977, Clem 1977, Coulter 1966). For resting and denning, fishers typically use hollow trees, logs and stumps, brush piles, and holes in the ground (Coulter 1966, Powell 1977).

Within a 1-mile radius of the Project Area, there are approximately 3,169 acres of fisher preferred habitat types, with approximately 428 acres on the affected School Trust parcel.

3.10.3 Big Game

3.10.3.1 Elk

Elk tend to respond differently to habitat disturbance based upon the season of use of that habitat. It has been thought that reductions in overstory snow-intercept cover on winter range tends to reduce elk body condition due to increased energy expenditures and reduced food availability in deeper snow (Christensen et al. 1993). On summer range, during the logging operation there is direct and substantial disturbance of animals and their habitat. Once the operation is completed, most animals return to their normal home ranges (Lyon and Christensen 2002). Additionally, in the long term, the timber harvest has the potential to either improve or degrade habitat conditions for elk (Lyon and Christensen 2002). Two of the most notable long term disturbances post-harvest are the amount and distribution of logging slash, and resulting open road densities. The former can prove to be a major barrier to animal movement, and the latter can reduce utilization of an area by elk (Lyon and Christensen 2002).

Within the Project Area, there are currently approximately 4.55 miles of total road per square mile, and no open roads. Currently, there are 6 old clearcuts within the project, ranging in size from 15 acres to 80 acres, and totaling approximately 204 acres. As a result, younger forage is currently interspersed with older forest patches on the parcel.

The cumulative effects analysis area encompasses approximately 525 square miles, and corresponds to the forested area within Hunting District 292, and contains portions of the Chamberlain and Lindbergh elk herds' seasonal home ranges (Burcham et al. 1998). Within the analysis area, there are approximately 711 miles of open road, for a total of 1.36 miles of open road per square mile, and at least 1,884 miles of total road, for a total of at least 3.59 miles of total road per square mile.

3.10.4 Other Issues

3.10.4.1 Northern Goshawk

The northern goshawk (hereafter goshawk) is a forest habitat generalist with specific nesting habitat requirements (McGrath et al. 2003, Squires and Reynolds 1997, Reynolds et al. 1992). The goshawk forages on a wide range of species, with the most predominant prey being snowshoe hare, Columbian ground squirrels, red squirrels, blue and ruffed grouse, northern flickers, American robins, gray jays, and Clark's nutcrackers (Squires 2000, Clough 2000, Watson et al. 1998, Cutler et al. 1996, Boal and Mannan 1996, Reynolds et al. 1992). Thus, given the diverse array of prey species, goshawks forage from a diverse array of habitats. However, (Beier and Drennan 1997) found goshawks to forage in areas based primarily on habitat characteristics rather than prey abundance. Beier and Drennan (1997) found goshawks to forage selectively in forests with a

high density of large trees, greater canopy closure, high basal area, and relatively open understories. For nest stands, goshawks will nest in pine, fir, and aspen stands on north-facing slopes that are typically in the stem exclusion or understory reinitiation stages of stand development, with higher canopy closure and basal area than available in the surrounding landscape (McGrath et al. 2003, Finn et al. 2002, Clough 2000, Squires and Reynolds 1997, Reynolds et al. 1992). Nests are typically surrounded by stem exclusion and understory reinitiation stands (with canopy closure $\geq$ 50%) within the 74 acres surrounding the nest; higher habitat heterogeneity than the surrounding landscape, and an avoidance of stands in the stand initiation stage of stand development typify habitat in the 205 acres surrounding goshawk nests (McGrath et al. 2003). Goshawk home ranges vary in area from 1,200 to 12,000 acres depending on forest type, prey availability, and intraspecific competition (Squires and Reynolds 1997).

An adult goshawk was observed flying out of a forested stand in the northwest corner of the Project Area during a field visit on 22 August 2005. The goshawk analysis area is approximately 12,090 acres, and is comprised of approximately 4,288 acres of BLM, approximately 1,064 acres of former industrial timber lands, approximately 954 acres of DNRC, and approximately 944 acres of Lubrecht Experimental Forest. Within the analysis area, approximately 3,211 acres would be available for potential nesting habitat (crown cover $\geq$50%, pole or mature forest), with approximately 378 those acres occurring on the Project Area. During 2008 and 2009, approximately 161 acres of goshawk habitat within the Project Area, and approximately 2,148 acres (67%) of goshawk habitat within the analysis area, were affected by mountain pine beetles and spruce budworm. Previous land management activities by adjacent private land owners and recent insect infestations have reduced the capacity of the analysis area for potential nest sites.

3.10.4.2 Great Grey Owl

Great gray owls forage upon a variety of rodents, including: voles, pocket gophers, shrews, moles, deer mice, and red squirrels (Bull and Duncan 1993). They are primarily a rodent specialist that favors areas near bogs, forest edge, montane meadows, and other openings. Like many other owl species, great gray owls do not build their own nests, they must use existing platforms constructed by other raptors (e.g., northern goshawks, red-tailed hawks) or native materials (e.g., broken-top snags, mistletoe brooms). Because this species must rely upon nests of other species and the availability of natural structures, the habitat surrounding great gray owl nest sites is also variable. However, given habitat needs of red-tailed hawks and northern goshawks, as well as the size of trees necessary to provide the area for a family of owls on a mistletoe broom or broken-top snag, many of the nests (47 of 49; 96%) in a study in northeastern Oregon were located in stands with $\geq$ 2 canopy layers and a canopy closure > 60%

at most nests (Bull, Evelyn L. and Henjum, Mark G. 1990). A great gray owl was observed in the northwest corner of the parcel on 22 August 2005 (M. McGrath, DNRC Wildlife Biologist, personal observation). Because the observation occurred late in the breeding season, nesting status on the Project Area could not be ascertained. For foraging habitat, the five old clearcuts likely serve the role as openings that provide rodent habitat for great gray owls.

4.0 Environmental Consequences

Introduction

Chapter 4: Environmental Consequences describes the direct, indirect, and cumulative effects of the proposed action on various resources within the analysis area.

4.1 Water

4.1.1.1 Alternative A: No Action, Direct and Indirect Effects on Water Quality

Direct, indirect or cumulative effects to water quality or quantity would be similar to effects described under the existing conditions. Sedimentation will continue principally at the existing stream crossings with inadequate surface drainage and road segments where road fill-slopes are encroaching on stream channels. Historic crossings on the main Union Creek road were undersized for fish passage and sources of sediment that affected sedimentation, bank erosion and flows. The levels of continued sedimentation will depend mainly on the levels of year round road use, road maintenance and precipitation.

Mountain pine beetle attacks to mainly older age lodgepole pine and some ponderosa pine are increasing tree mortality resulting in a spotty loss of forest canopy within the area. Water yields may increase naturally as a result of continued tree mortality from insects or wildfire, but are expected to decline as current young stands of trees from previously harvested areas, advance in growth and increase tree cover. On upland sites there are low to moderate cattle effects on the intermittent stream segments on DNRC. Grazing management within the drainage would continue and should gradually improve over time as inspections and management modifications are made.

4.1.1.2 Alternative B: Harvest, Direct and Indirect Effects on Water Quality

The proposed project would harvest approximately 2-3 MM board feet of forest products from approximately 345 acres of the DNRC Section 36, T13N, R15W with a modified shelterwood treatment, and as described in the vegetation section (Natural Forest Conditions and Summary Alternative B: Harvest, Chapter 2.4.2). The proposed harvest would improve tree spacing and growth while retaining the dominant overstory and a distribution of tree size classes.

The primary risks to water quality are sediment from roads and stream crossings and potential channel effects of increased water yield. Water yield is further discussed under cumulative effects. The proposed timber harvest is designed to prevent impacts to water quality from off-site erosion through the implementation of BMP's, protection of riparian areas with adequate buffers and site specific mitigations. No timber harvest or road construction is planned near or in the SMZ/RMZ of Washoe Creek, and no SMZ harvest is planned

along the Class 2 stream segments in the section and all riparian attributes would be maintained including long term recruitable trees for large woody debris to stream channels. Harvest would be completed by ground based equipment. The bulk of the harvest would be on moderate slopes less than 30% that would minimize disturbance and erosion, and presents low risk of sedimentation.

The proposed haul routes would use primarily existing roads. The Timber Sale Contract would require construction and re-construction of road surface drainage improvements to existing roads to reduce current sediment sources and meet BMP's. The proposed action would construct approximately 2.75 miles of road within the Project Area. New roads would be constructed on stable slopes and by design and requirements within the Timber Sale Contract would meet BMP standards. Three stream crossings are proposed on intermittent and ephemeral drainages within the project section, but no new crossings of Washoe Creek. There would be no increase in open road density which should help reduce road maintenance.

On the Union Creek Road, two undersized stream crossings that are partial fish barriers would be replaced with larger culverts to improve flow, fish connectivity during low flow, and reduce sediment. There is a risk of short term, low to moderate sediment impacts during the replacement of the Union Creek crossings until the road fillslopes stabilize. Site specific erosion control measures will be implemented to minimize sedimentation. The improved crossings should reduce erosion and sedimentation and improve overall watershed condition and long term water quality in the lower drainage.

In summary, DNRC would implement all applicable BMP's and Forest Management Rules and TMDL measures to protect water quality. Overall there is risk of short term, low to moderate impacts to sediments, water quality and beneficial uses associated with the proposed timber harvest and road construction, due to the following reasons:

1. No SMZ or RMZ harvest is proposed to protect intermittent stream channels and limit disturbance near riparian areas

2. Isolated wetlands would be protected with Wetland Management Zone (WMZ) boundaries.

3. New stream crossings would be on intermittent segments with very low risk of sediment delivery to Washoe Creek.

4. Combined mitigation measures for harvest operations and season of use would all be directed at minimizing soil disturbance to prevent erosion and sedimentation,

5. Road maintenance and repairs and replacement of the Union Creek crossings would be expected to reduce current erosion and sediment sources to improve water quality.

4.1.2.1 Alternative A: No Action, Cumulative Watershed Effects

Under the no-Action Alternative, cumulative effects would remain the same as described in existing conditions. The effects would be most likely to decline over time as insect mortality declines and hydrologic recovery continues. A risk of fire always exists that may result in erosion and sedimentation from increased bare ground and, is heightened by the increased fuel load due to recent insect mortality. No recent wildfires have occurred in the Washoe drainage.

4.1.2.2 Alternative B: Harvest, Cumulative Watershed Effects

Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of past, current or foreseeable future disturbances, both natural (fire) and human-caused. Past, current, and future planned activities have been taken into account for the cumulative effects analysis. Past management activities in the proposed Project Areas include timber harvest, road construction, grazing, irrigation diversions and fire suppression. A detailed watershed analysis of sediment sources and harvest areas was conducted to determine the cumulative watershed effects for the Washoe Creek watershed. Concerning water yield, tree canopy reduction by timber harvest activities, tree mortality or wildfire can affect the timing of runoff, increase peak flows and increase the total annual water yield of a particular drainage. Increased water yield can increase stream channel scour and in-stream sediments that impact water quality.

Within the cumulative effects analysis area, DNRC has proposed to harvest approximately 345 acres. The proposed harvest would be a modified shelterwood that would retain a healthy overstory of ponderosa pine, western larch and Douglas-fir. Within harvested areas approximately 30-40% of crown cover would be maintained. A minimum of 40% crown cover would be maintained within approximately 130 harvested acres classified as Lynx Habit. Within areas receiving a salvage treatment, dead and insect infested trees would be harvested and crown cover would likely be reduced to the lower end of the range of 30-40% crown cover. This is described in Natural Forest Conditions and Summary Alternative B: Harvest, Chapter 2.4.2.

The proposed ground based timber harvest and use of existing roads is expected to result in low impacts to sediment and water quality on Washoe Creek from the planned operations based on implementation of BMP's and mitigation measures during timber harvest.

The proposed new road construction and crossings of intermittent streams has low potential for measurable off-site sediment delivery to Washoe Creek. There is a risk of short term, low to moderate impacts resulting from increased sedimentation during and shortly after the stream crossing replacements on Union Creek. All reasonable erosion control measures would be implemented during crossing replacement and any sedimentation should quickly subside. We expect there will be a long term benefit to Union Creek due to a reduction in current sediment from road drainage and stream channel instability at the crossing sites. Potential sediment from planned road maintenance and repairs

along the access roads are unlikely to exceed current levels on road segments with inadequate road surface drainage, and sediment should be reduced shortly after repairs are completed. Examples of maintenance items include cleaning culvert inlets, restoring existing road surface drainage and adding road surface drainage where needed. The combination of road drainage improvements, and maintenance measures would reduce existing sediment sources and are expected to have a positive benefit in reducing sedimentation and improving water quality on Union Creek.

To assess conditions and potential impacts of the proposed harvest, a fine filter assessment of water yield, stream channel conditions and sediment source survey was completed by DNRC soils and hydrology specialists on the Project Area that included previous harvests and existing access roads. When we look more specifically at the extent of forest cover, conifer regeneration, stream channel conditions and harvest on the DNRC project we expect a low level of cumulative watershed impacts from water yield increases estimated from this proposal. As a relative comparison, an estimate of the existing ECA is 1,041 acres for Washoe Creek and the allowable ECA is 1,696 acres which is equal to 655 acres available. The ECA increment of the proposed action is 157 acres harvest (equivalent to regeneration cut) or about 24% of the 655 acres available. The allowable water yield increase was set at 10% for this analysis considering that Washoe is sediment impaired and a Class 1 fishery stream. The existing water yield increase over a fully forested condition is 8.2% and would increase to 9% with the proposed action. This low level of increased ECA and increased water yield from this project would be less than the 10% allowable water yield increase threshold of concern and is not expected to have a measurable effect on Washoe Creek following the proposed harvest. It is unlikely that minor increases in stream flow could have measurable impacts to stream channel form and function of Washoe Creek and the tributary stream segments directly below the DNRC project parcels. Based on all of the previous discussion, there are low potential for cumulative effects to sediment, or water yield increase impacts to Washoe Creek stream channel stability.

4.2 Soils

4.2.1.1 Alternative A: No Action, Direct-Indirect and Cumulative Effects on Soils

The effects of the No Action Alternative would be the same as previously described under existing conditions for soils. With No Action, roads will continue to erode depending on the level of maintenance implemented.

4.2.1.2 Alternative B: Harvest, Direct and Indirect Effects on Soils

The proposed project would tractor harvest approximately 2-3 MM board feet of forest products from approximately 345 acres within the 640 acres. The proposed harvest would be a modified shelterwood. The proposed intermediate (and partial) cuttings (improvement, low thinning, thinning, sanitation-salvage, selection and shelterwood harvests would remove dead, diseased, and overstocked trees, salvage lodgepole pine and Douglas-fir, improve tree

spacing, reduce plant competition and improve growth. Hauling access would primarily use existing roads and site specific road recommendations would be implemented on existing roads to maintain, restore and improve road surface drainage to control erosion. Approximately 2.75 miles of new road would be constructed on stable locations selected to minimize the extent of road required. Disturbed roads and landings would be stabilized and grass seeded after use.
The primary risks to long term soil productivity and hydrologic function are excessive impacts to soil properties caused by rutting, compaction and displacement of surface soils by equipment operation and road construction. Those soils which are most sensitive to operational impacts are limited to small areas of steep slopes, erosive soils and wet sites which would be avoided or protected with mitigation measures. For the proposed harvest, BMP's and mitigations would be implemented to minimize the area and degree of detrimental soil impacts (displacement, erosion, and compaction). Mitigations include general skid trail planning, limit skidding to moderate slopes, avoiding wetlands and controlling soil disturbance to meet silvicultural goals to promote conifer regeneration. To reduce soil disturbance and potential erosion, ground based harvest operations would be limited to slopes less than 45% approximately on the Winkler soils, and ≤ 35% approximately on the Shooflin soils that are more sensitive to displacement.
On all proposed harvest areas a portion of old and new coarse woody debris (CWD>3" dia.) at approximately 5-10 tons/acre and a majority of fine litter (similar to historic ranges) would be retained or return skidded on harvest units. CWD and fine litter return organic matter to the soil and acts as a mulch to enhance protection of surface soils, maintain soil moisture and provide media for healthy soil fungi and conservation of soil nutrients important to tree growth. Protection of established regeneration and healthy over-story trees would be a priority. The improved tree spacing is expected to result in improved growth, due to reduced competition for limited soil moisture and nutrients.
Based on DNRC soil monitoring on comparable sites (DNRC 2005), implementation of BMP's and the recommended mitigation measures, the proposed harvest and road operations would present a low risk of excessive impacts to soils if impacts are restricted to approximately 15%-20% of the proposed harvest areas. We expect that by protecting approximately 80-85% of a harvest area in non-detrimental soil impacts, soil properties important to soil productivity would be maintained and similar to the effects observed on the 1989 harvest areas within the section. Previous harvest resulted in an average range of 16.5-18.5 % detrimental soil effects using an older Hahn Harvester technology. Timber Sale Administrators would monitor ongoing harvest and road construction activities to meet contract requirements, BMP'S for soil and water protection and silvicultural objectives. For all of these reasons the proposed harvest operations and mitigation measures are expected to maintain soil properties important to plant growth and hydrologic function and present low risk of direct and indirect impacts to soils.

4.2.1.3 Alternative B: Harvest, Cumulative effects to soils

Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction, depending on area and degree of detrimental impacts. The initial entries on portions of these forested sites occurred in 1988. The areas affected have recovered and left less than 10% of area effects on the soils, with few trails still evident. The observed trails have re-vegetated and are stable and the sites have been regenerated to young trees. This level of effects is consistent with DNRC soil monitoring (DNRC 2004) to maintain soil properties conducive to hydrologic function, plant growth and maintain long term productivity.

There is low risk of cumulative effects to soils with the proposed harvest based on implementation of BMP's, skidding and slash disposal mitigation measures to limit the area impacted. All newly disturbed roads and landings would be grass seeded to promote prompt re-vegetation and reduce erosion. Any future harvest would likely use the same road system and skid trails and landings to reduce the risk of cumulative effects. Improved tree spacing is expected to reduce competition for nutrients and soil moisture, enhance growth of retained trees, and promote regeneration of conifers.

4.3 Fisheries

4.3.1.1 Alternative A: No Action, Direct and Indirect Effects on Fish Habitat

With No Action, no road construction or planned timber harvest would occur. The direct, and or in-direct impacts to fisheries would be similar to the existing condition. There would be no change in current stream connectivity on Washoe Creek or Union Creek. No restoration projects are currently proposed in Washoe Creek or Upper Union Creek.

4.3.1.2 Alternative B: Harvest, Direct and Indirect Effects on Fish Habitat

With the implementation of the Action Alternative, no harvest or disturbance of riparian soils or vegetation would occur within SMZ's or RMZ's adjacent to Washoe Creek or on upland tributary stream segments on the DNRC project section. While these small steep stream segments are not fish habitat, the class 2 segments would be protected as such, to provide a sediment buffer and to protect and maintain riparian zones. The proposed road construction includes installation of three midslope stream crossings on the DNRC section. There would be low risk of sediment impacts to Washoe Creek or fish habitat from construction of new crossings on intermittent stream as described in the water quality section. There would be no change in current stream connectivity on Washoe Creek.

The restrictive road crossing culverts on Union Creek are planned for replacement and would directly improve connectivity on 1.25 stream miles of Union Creek and indirectly improve connectivity from the crossing in Section 11, T 12N, R15W and downstream for several stream miles. As noted in the water quality section, there is a risk of low to moderate level, short term effects to sediment during and shortly after culvert replacements on Union Creek and

road drainage repairs and site specific maintenance to improve drainage on existing roads. Potential sediment is expected to be quickly reduced to less than existing conditions with implementation of BMP's and mitigation measures. Erosion control and re-vegetation would be implemented to reduce current sedimentation at Union Creek crossing sites and along the access route.

4.3.1.3 Alternative A: No Action, Cumulative Effects on Fish Habitat

No timber harvest or road construction is associated with this alternative. Existing sediment sources from existing roads, grazing and land uses would continue to contribute sediment to streams in the analysis areas until remedial action were implemented or natural stabilization occurs.

4.3.1.4 Alternative B: Harvest, Cumulative Effects on Fish Habitat

There is low risk of additional cumulative impacts to fisheries in the Project Area, including Washoe Creek and Union Creek with the proposed timber harvest and road maintenance, due to the following reasons:

1) No harvest is planned near Washoe Creek in streamside management zones (SMZ's) or riparian management zones (RMZ's) adjacent to this fish bearing stream.

2) The proposed new stream crossings on upland sites are not expected to deliver measurable sediments to Washoe Creek.

3) The estimated water yield increases are small, do not exceed the threshold established and have low risk of impact to sedimentation, channel form or function.

4) Road surface drainage improvements and maintenance would reduce current sedimentation on proposed haul routes.

5) No new roads would be constructed adjacent to fisheries streams or in locations that could contribute sediment to streams.

6) Combined mitigation measures for harvest operations and season of use are all directed at minimizing soil disturbance to prevent erosion and potential sedimentation to unnamed tributary streams of Washoe Creek .

7) There would be a benefit to fish habitat connectivity on Upper Union Creek with the planned replacement of two culverts that are partial fish barriers.

4.4 Weeds

4.4.1.1 Alternative A: No Action, Effects on Noxious Weeds

With No Action, noxious weeds will continue to spread along roads and may increase on the drier site habitats. Following disturbance events such as timber

harvest activities, fires, or grazing, the establishment and spread of noxious weeds is more prevalent than in undisturbed areas. DNRC would treat selected sites along open DNRC roads based on funding availability. The grazing licensees would be required to continue weed control efforts consistent with their use.

4.4.1.2 Alternative B: Harvest, Effects on Noxious Weeds

The Action Alternative would involve ground-disturbing activities that have the potential to introduce or spread noxious weeds in susceptible habitat types. For the Action Alternative, an Integrated Weed Management (IWM) approach was considered for treatment of existing and prevention of potential noxious weeds. For this project: prevention, re-vegetation and weed control measures for spot outbreaks are considered the most effective weed management treatments. Prevention measures would require cleaning of off-road equipment. Roadsides would be sprayed prior to operations and weed control and re-vegetation would reduce noxious weed density and occurrence compared to no-action. There would be similar or potential slight increase in weed infestation with harvest units due to soil disturbance and decreased tree canopy. Control efforts would promote re-vegetation and emphasize treatment of any new noxious weeds. Herbicide application would be completed on segments of DNRC roads along the haul route, to reduce weed spread along roads and promote desired vegetation for weed competition and to reduce sedimentation. Herbicide would be applied according to labeled directions, laws and rules, and would be applied with adequate buffers to prevent herbicide runoff in surface. Implementation of IWM measures listed in the mitigations would reduce existing weeds, limit the possible spread of weeds, and improve current conditions, to promote existing native vegetation. More weed control would occur compared to the No-Action Alternative and grass and competitive vegetation would increase along roads.

4.5 Forest Vegetation

4.5.1.1 Alternative A: No Action, Direct and Indirect Effects on Forest Vegetation

Under the No Action Alternative no harvesting of timber would take place. Mature primarily Douglas-fir stands with slow growth rates would remain much as they are now for the foreseeable future. Pole size Douglas-fir and lodgepole pine stands would continue to increase in relative density as a result of increasing in size. Growth rates in these stands would be low as the trees continue to compete with each other for moisture and growing space. Tree mortality would continue as a result of competition (and possible continued drought) stress and subsequent insect attacks. Shade intolerant species such as Western Larch and Ponderosa pine would decline over time due to competition and lack of any disturbance such as fire or changes to forest/ vegetative conditions. Timber Stands would remain at risk to stand replacement fire effects.

4.5.1.2 Alternative A- No Action, Cumulative Effects on Forest Vegetation

Slow growth rates and mortality within some stands would continue. Fuel loads would increase, as would the potential for an increased risk of stand replacement fire. The potential for effects as a result of activities associated with timber harvest on lands other than DNRC exists and would likely continue into the foreseeable future. DNRC ownership increased from approximately 10% to approximately 25%, of the land area within the Garnet Analysis Area, a result of the November 17, 2010 purchase of approximately 31,000 acres from TNC (see 4.3.2.1.4.). The potential for cumulative impacts associated with the No Action Alternative with respect to vegetation and Natural Forest conditions is predicted to be negligible.

4.5.1.3 Alternative B: Harvest, Direct and Indirect Effects on Forest Vegetation

Under the Action Alternative approximately 345 acres are proposed for harvest. Of this, approximately 81 acres of Douglas-fir stands, approximately 38-44 acres of Western Larch/ Douglas-fir stands, approximately 113 acres of Ponderosa pine stands, approximately 52 acres of sub-alpine fir stands and approximately 81 acres of mixed conifer stands would be reduced from on average approximately 160 square feet of basal area per acre to 40-60 sq. ft. of basal area or approximately 50-80 sq. ft. of basal area within Lynx habitat.

Within harvested areas approximately 30-40% of crown cover would be maintained. Within areas receiving a salvage treatment, dead and insect infested trees would be harvested and crown cover would likely be reduced to the lower end of the range of 30-40% crown cover.

Where harvest areas coincide with "Lynx Habitat" (approximately 130 acres, Table 4-1 below), sufficient tree canopy would be left so as to provide a minimum of 40% crown closure (percent area of tree crowns compared to a given area). Crown closure would be provided by retaining dominant seral tree species; some pole size trees and saplings would provide cover as well. Within portions of harvest areas advanced regeneration of shade tolerant species (sub-alpine fir and spruce saplings) would be retained along with intolerant species. It is not un-common on these Northern more mesic aspects for non-lethal fires to occur, within Fire Group 8 (as defined by Fischer and Bradley), thus encouraging shade tolerant species to perpetuate, that is, stands to develop towards climax conditions. Encouraging shade tolerant species is a departure from Desired Future Conditions as prescribed in ARM for Forest Management. However, the fine filter analysis directed management goals to favor critical forest attributes associated with forested stands classified as Lynx Habitat.

SLI estimates of the total crown cover density for timber stands within the Project Area are 13% Medium stocked and 87% well stocked. Medium crown cover is 40-69% crown cover and Well is 70-100% crown cover (CC) density. The remaining sapling stands in the Project Area are estimated to be in a Medium and Well stocked conditions, comprising approximately 32% of the Project Area for both classes combined. The proposed harvest areas are in a Medium or Well-stocked condition. For Harvest areas that are currently Well stocked (70-100% CC) and within Lynx habitat potentially 30-60% of the cover would be available for harvest. If the stand had 160 square feet of basal area then approximately 64 sq. ft. of basal area would need to be left to provide cover for Lynx.

Table 4-1 Proposed Harvest within Lynx Habitat (SLI 2008)		
Section	Approximate acres	Lynx Habitat
36	14	Denning/ mature
	90	Other
	26	Mature
Total	130	

The weighted average diameter for trees within the Project Area that are merchantable is 12.4" dbh approximately. Given a stand with 64 sq ft of basal area and a corresponding average diameter for leave trees of 12.4" dbh (0.839 sq ft per 12.4" diameter tree), then there would be 76 trees per acre (tpa) (64/0.839 = 76.281) left on a 24' square foot spacing. Basal area is equal to the dbh of a given tree squared times 0.005454. If the average diameter for leave trees was 16" dbh (1.396 sq ft per 16" diameter tree) and there was 64 sq ft of basal area left, then there would be approximately 46 tpa left on a 31' square foot spacing for leave trees approximately.

Leave tree selection would favor dominant and codominant trees of best available health, vigor, and form including full crowns. Generally trees with well-developed crowns represent the largest diameter trees, for a given age class. It is estimated that the basal area retained within Lynx Habitat harvested would range from approximately 50-90 sq. ft. of basal area.

There are formulas available that estimate that for Douglas-fir stands with 40 % CC that the basal area would range from 50-60 sq.ft. Dealy's research suggests basal areas as low as 25 sq. ft. may provide canopy closures of 40%. His work also suggests that BA's of 50 sq. ft. provide canopy closures of between 55 and 65% (Dealy, J.E. 1985). However, given his caution regarding thinned stands, it is recommended that basal areas of 50 to 60 sq. ft., be retained to provide 40% canopy cover. There is however a poor correlation between Crown Closure and Basal Area (McLeod, Scott 2005, DNRC draft memo).

As a result of maintaining 40% crown closure, these primarily Douglas-fir stands would resemble a portion of the potential natural variability for fire

maintained open, park like stands that were typical prior to Euro-American settlement. That is, stocking levels within stands occurred above and below this stocking level within this fire type (Six as defined by Fischer and Bradley 1987). Maintaining this stocking level (60-90 sq. ft. basal area) may not optimize growth potential. For Douglas-fir stands stocking levels of 50-70 sq. ft. per acre of basal area is widely accepted as optimal for growth and yield, and health, especially with respect to resistance to insect attack (Douglas-fir Beetle). There may be a slight risk for increased mortality associated with maintaining these stocking levels and the subsequent susceptibility to attack from Douglas-fir Beetle. Negron, J.F and others (1999) found that for Western Montana and Northern Idaho, in Douglas-fir stands of high-hazard conditions (age over 100 years, average diameter over 16" d.b.h, and high percentage of Douglas-fir in the stand), that mortality in Douglas-fir stands with a basal area of 115 sq. ft. per acre or less averaged 37 sq. ft. beetle-caused mortality, and could be defined as "low" risk (Negron et. al. 1999).

The DNRC has adopted the Green et al definition of Old Growth (ARM 36.11.403). For the habitat types and cover types within the Project Area, the minimum Old Growth (Green et al 1992) criteria are as follows: for the Western Larch and Douglas-fir cover types there needs to be a minimum of 10 trees per acre (tpa) ≥ to 17" or 8 tpa ≥21" inches in diameter at breast height (dbh) and these trees must be ≥ to 180 years old; for the lodgepole pine cover type there needs to be a minimum of 10 tpa ≥13" dbh that are ≥140 years old. These minimums would be incorporated into the harvest design where they exist. The 2008 SLI estimates that there is possibly 95 acres within the Project Area that meet the Green et al definition for Old Growth. Stands classed as ≥150 years within the Project Area were stratified and sampled as per SLI protocol in July 2006. This survey estimated that within the Project Area approximately 80 acres meet the Green et al criteria. These stands are of the Douglas-fir and Western Larch/ Douglas-fir pine cover types, and represent approximately 12% of the Project Area.

Trees within these Old Growth stands would account for approximately (minimum) 15-24 square feet of basal area (basal area for a 17" dbh tree is approximately 1.576 sq. ft.; for a 21"dbh tree approximately 2.4 sq.ft.). Dominant trees of best available health, vigor, and form would be retained where available. 40-60 square foot of basal area would be retained within these stand areas, as individuals or in groups. Currently there is Douglas-fir beetle mortality occurring in theses stands with a mature Douglas-fir component, Old Growth or not. A minimum of 1 snag (dead tree) per acre greater than or equal to 21"dbh would be left. Openings created within the stands would encourage regeneration within these stands and a new age class of trees to be developed. The harvest would emulate the effects of the mixed severity fires which were common within Fire Group 6 (as defined by Fischer and Bradley, 1987) or the effects of continued Douglas-fir beetle mortality.

Leaving areas with canopy cover of more than 40% that were composed of large trees at fairly high densities would give the appearance of having burned with less intensity when compared to treatments in adjacent stands (areas) that would emulate a mixed severity burn. This would emulate the variable effects of fire to produce differing stand structures.

The predominant treatment in the Douglas-fir and Douglas-fir/ Western Larch type stands would employ a shelterwood system. Intolerant species such as Western Larch and Ponderosa pine would be maintained where they occur (additionally emulating fire effects). These stands would be left in a stocked condition favoring growth (approximately 60 sq. ft. where mitigations for wildlife are not indicated). Intermediate cuttings would be a combination of improvement, thinning, sanitation-salvage type treatments. There would be flexibility to create some small openings (1-5 acres). Some areas would be cut to favor regeneration, where stocking levels for leave trees would be 40sq.ft.of basal area. These openings would likely occur in areas where the trees are of low or declining vigor and or areas of Douglas-fir beetle activity (sanitation-salvage treatments). Within areas receiving a salvage treatment, dead and insect infested trees would be harvested and crown cover would likely be reduced to the lower end of the range of 30-40% crown cover. The majority of the lodgepole pine component of stands within the Project Area (especially within the NE1/4 and the NE of the SW 1/4 parts of the Section) are dead or infested with Mountain pine beetle. Additional openings would be created adjacent to shade intolerant seed trees. Good quality advanced regeneration would be maintained and protected in areas where it occurs. There are stands that have a component of Ponderosa pine and this species would be favored for retention over Douglas-fir. These stands would be managed with improvement-selection cutting, managing for retention of growing stock as well as maintaining and recruiting larger diameter seed-trees for future entries. Some openings may be created as a result of pine beetle infestations (sanitation-salvage), and these openings would encourage regeneration of a new age class. Openings are predicted to be a small percentage of the area at this time, although within the NW1/4, NW1/4 of the Section insect caused mortality of ponderosa pine as late as 2010 was observed on the equivalent of approximately 10 acres. Stocking levels would vary (plus or minus 20 sq. ft.) throughout these stands with a Ponderosa pine component and on average approximately 60-70 sq. ft of basal area would be retained to achieve a minimum of 40% crown cover post harvest, as the stands within the NW1/4 are classified as Lynx Habitat.

Table 3-4 shows that of the Harvest area: 5% of the area is stands 40-99 years old, 84% 150+ and 11% Old Growth (as defined by Green et al). The proposed intermediate (and partial) cuttings (improvement, low thinning, thinning, sanitation-salvage, selection and shelterwood harvests), within the Project Area would not change the age class for these stands that are currently even aged. Un-evenaged stands would remains so, as

well. Cutting within the multi-storied structures, if they were low thinned would increase the average stand age (however this may not necessarily change the age class). The age class for multistoried or heterogeneous structures would not likely change if individuals of all ages were harvested, although the average stand age could increase. In all cases the proposed harvest would likely not change the age class distribution but rather trend age classes to what was typical historically.

There are limited opportunities to shift the cover type representation within the Project Area and subsequently on Missoula Unit (see chap. 3). Approximately 183 acres within the Project Area are not in an appropriate cover type condition as indicated by the SLI model. There is a mixed conifer stand approximately 29 acres that could be moved towards an appropriately Douglas-fir cover type by harvesting the lodgepole pine and sub-alpine fir component. There is a lodgepole pine stand (approximately 32 acres) that could be moved towards an appropriately Douglas-fir cover type by harvesting the lodgepole pine component. A sub-alpine fir stand could be moved towards an appropriately Douglas-fir cover type through harvesting the sub-alpine fir component (converting 9 acres of 23 acres, the remaining 14 acres would be deferred from harvest for Lynx denning and Elk habitat). There is a mixed conifer stand approximately 55 acres that could be trended towards an appropriately Douglas-fir cover type by harvesting the lodgepole pine and sub-alpine fir component; although it is estimated that approximately 2 acres within a stream side management zone would be un-harvested. However maintenance of a minimum of 40% crown closure may require leaving a portion of the sub-alpine fir component so as to prevent the species composition shift. The same may be true for a 44 acre sub-alpine fir stand that is Lynx Habitat as well; although it is estimated that approximately 5 acres within a stream side management zone would be un-harvested. Within Lynx Habitat, maintaining 40% crown closure would take precedence over potential vegetative shifts.

The proposed harvest would account for approximately less than half a percent of the total acreage comprising Missoula Unit. The proposed harvest for the majority of the harvest area would emulate a fire-maintained open forest condition that was typical prior to the Euro-American settlement period. Except for the aforementioned (cutting within Lynx Habitats), the proposed harvest would trend stands within the project towards the desired future condition.

This proposed timber sale would not alter the age class distribution on Missoula Unit or within the GAA. It would modify forest cover by reducing stand density to what was more typical of historic conditions. This project would have a low potential to reduce mature forest cover below what Losensky reported when compared to forest cover on Missoula Unit or within the GAA.

Harvest within Old Growth Stands within the Project Area would maintain a minimum of quantifiable Old Growth attributes (large old trees; see

4.3.2.1.3 Green Old Growth Criteria) that would maintain their status as Old Growth as defined in ARM. Consequently there is a low risk that the Harvest Alternative would reduce the amount of Old Growth, because these stands would retain the minimum amounts of Green et al Old Growth attributes, as required in ARM. Old trees would continue to die, potentially to continued endemic insect attack and senescence. Other leave trees with improved vigor post harvest would replace some of these larger trees should they die and increase in diameter. Mitigations that would be expected in part to maintain site productivity are nutrient cycling through retention of slash (needles, branches and larger coarse woody debris generated from harvest) on site (see mitigations for soils, Chap. 2.6.1). The retention of the majority of the largest trees of seral species would occur. By reducing stand density and altering species composition to levels more typical of pre-settlement times, we would expect an increase in growth and vigor. The removal of trees most susceptible to insects and disease and reducing the available fuel loadings reduces the risk of stand replacing wildfire. The reduction of stand density would make limited resources (water, nutrients, and light) much more available to the remaining trees. Improved stand health would decrease risk of insect and disease infestations and potentially reduce the risk of stand replacement wildfire.

4.5.1.4 Alternative B: Harvest, Cumulative Effects on Forest Vegetation

Reducing stand densities in part would move stands within the Project Area towards a condition that was more prevalent historically, typified by more open, park-like stands.

The proposed harvest would account for approximately less than half of one percent of the total acreage comprising Missoula Unit.

The Garnet Analysis Area (GAA) is the portion of Missoula Unit (DNRC Trust Lands) East of the confluence of the Blackfoot River and the Clark Fork River including the area between these two rivers. As of December 15, 2008 The Nature Conservancy (TNC) purchased approximately 75,000 acres of Corporate forest lands within and adjacent to the Garnet Analysis Area. The DNRC purchased approximately 31,0000 acres from TNC (previously owned by PCTC) within the Garnet Mountains. This area, south of Potomac (and Highway 200), extends from Bear Creek on the west side, to Union Creek on the east side; within the Blackfoot River drainage (including approximately 6 square miles that is within the Cramer Creek drainage, tributary of the Clark Fork River drainage). Referring to Table 4-2 below; an effect of this purchase is that Corporate ownership within the GAA was reduced by approximately 31,000 acres and the DNRC ownership within the GAA has increased by approximately 31,000. Consequently Corporate ownership has decreased from approximately 42% to approximately 27% of the GAA; and DNRC ownership has increased from approximately 10% to approximately 25%

of the GAA. These lands were harvested (additional overstory removed) in 2010 prior to the DNRC's acquisition of them. Generally, the majority of these lands are stocked with saplings and poles; with a poorly stocked sawtimber component.

Table 4-2: Land Ownership within the Garnet Analysis Area (SLI 4/2001)

OWNER NAME	COUNT	SUM_ACRE	Percent Area
BLM	42	25,336.7220	12.35%
Forest Service	5	45.9710	0.02%
Corporate	47	85,585.1010	41.73%
Private	63	54,065.5500	26.36%
State Parks and Recreation Are	1	55.1530	0.03%
State of Montana (DNRC)	43	21,437.3710	10.45%
State of Montana (Other)	6	6,143.8330	3.00%
Unknown	12	12,310.5040	6.00%
Water	11	93.5810	0.05%
Total	230	205,073.7860	100.00%

Losensky reported that for Climatic Section 11(Bitterroot-Blackfoot), 9.1% of the area was in a non-stocked forest type and that 22.7% of the area was comprised of stands in the 1-40 year old age class (seedling, saplings). Pole size to Mature stands (41-140 years old) comprised, on average, 46% of the area, with approximately 22% of the area potential Old Growth (141+ years), see Table 3-5. Although for Douglas-fir stands (most prevalent within the Project Area) Losensky found: non-stocked 3.6%, 1-40 years 19.7%, Poles to Mature 69% and Potential Old Growth 7.4%. Table 3-5 shows most notably much less 0-39 year old stands and more 100-Old stands on Missoula Unit, compared to what Losensky found. This proposed timber sale would not alter the age class distribution on Missoula Unit or within the GAA. It would modify forest cover by reducing stand density to what was more typical of historic conditions. This project would have a low potential to reduce mature forest cover below what Losensky reported when compared to forest cover on Missoula Unit or within the GAA.

Implementing either alternative considered in this Environmental Assessment would have negligible cumulative effects when consider together with actions taken on other adjacent forested landowner's property.

The Harvest Alternative would move harvested stands towards a condition that was more typical of Historic Conditions, more open, park-like forests. The potential to reduce mature forest cover would be very low. Modified shelterwood treatments would maintain 40% crown cover within harvest areas classified as lynx habitat and approximately 40-80 sq.ft. of basal area through out all harvested areas. Harvest within Old Growth Stands within the Project Area would maintain a minimum of quantifiable Old

Growth attributes (large old trees; see 4.3.2.1.3 Green Old Growth Criteria) that would maintain their status as Old Growth as defined in ARM. Consequently there is a low risk that the Harvest Alternative would reduce the amount of Old Growth, because these stands would retain the minimum amounts of Green et al Old Growth attributes, as required in ARM. Old trees would continue to die, potentially to continued endemic insect attack and senescence. Other leave trees with improved vigor post harvest would replace some of these larger trees should they die and increase in diameter. Cumulatively there is a low to moderate risk of effects to mature forest cover including Old Growth, should the Harvest Alternative be selected.

Some other effects of altering forest cover are discussed within the Hydrological and Wildlife portions of this document.

4.6 Air Quality

4.6.1.1 Alternative A: No Action, Effects to Air Quality

Wildfires would continue as a threat to forested areas. If a wildfire were to start within the Project Area the rate of spread and the intensity of the fire could be high due to the dense structure and presence of ladder fuel on the site. The potential for stand replacement crown fire exists. In the event of wildfire, air quality would be affected. There would be no logging slash generated.

4.6.1.2 Alternative B: Harvest, Direct and Indirect Effects to Air Quality

Forest fuel treatments:

A portion of the logging slash would be retained or returned within harvest areas for nutrient retention (Timber Sale Contract stipulation). Consequently approximately 5-10 tons per acre of coarse woody debris (>3" in diameter) and including finer fuels (< 3'' diameter, limbs and foliage) would be retained or returned within harvested areas. Total accumulations of up to approximately 30 tons per acre, would be possible in some areas. Slash retained for nutrient cycling would be kept away from leave trees to the greatest extent possible and fuel breaks would be employed along property boundaries and along the ridge top. These would be controlled and monitored during harvest operations through Timber Sale Administration. Removal of pulp, small round wood and cull sawlog material (although optional) would reduce fuel load. That is, it is expected that some non-sawlog material that accumulates at landings would be hauled off site. The Timber Sale Contract would stipulate that slash would be lopped and or trampled to within 18" or less of the ground. Slash would dry for approximately one year, after which the DNRC would assess the need and benefit of burning any portion of the slash within harvested areas. Excessive amounts of slash, accumulations at landings and along roads, that were not scattered, would be piled and burned.

Logging slash retained or returned to within harvest areas would increase the risk of effects from wildfire short term (1-3 years approximately). That is, high fine fuel retention would be problematic (potentially increasing the rate of fire spread) with respect to fire control when compared to whole tree harvest and burning the majority of slash generated and accumulated at landing sites. Trampling, scattering and lopping slash within 18" of the ground surface is intended to minimize flame lengths to 4' or less should a fire ignite. Planned fuel breaks along property boundaries, either side of roads and along the ridge top would help contain a fire should one occur. If a fire were to occur during hot and dry conditions, resultant ground and surface fires would damage roots, root collars and boles (cambium damage) would kill some seedlings, saplings, pole size and larger trees, potentially resulting in low to mixed severity fire effects. More fire resistant species such as Western larch and Ponderosa pine would be favored. Planned modified shelter-wood harvest treatments would create openings and reduce tree stocking densities to a level that would be more resistant to crown fire, especially when compared to current forest stand conditions.

Slash piles would be burned in the fall when they are relatively dry inside but the layer of duff on the forest floor surrounding the piles is wet or snow covered to prevent fire spread.

Smoke management and dust generated during harvest operations:

The DNRC is required to submit acres proposed to be burned with the Monitoring Unit of the Montana/Idaho Airshed Group. The air-shed is thus regulated and burning would only take place when the proposed burn within a specific air-shed is approved (open) for burning. With proper smoke management applied, impacts to air quality should be minor and short in duration.

Harvesting and log hauling could create dust which may also affect the air quality within the Project Area and along the haul route. Harvesting operations would be short in duration thereby minimizing dust dispersal within the local residential areas. Direct and indirect effects to air quality due to slash pile burning, harvesting, and hauling associated with the proposed action are expected to be minimal and relatively short in duration.

4.6.1.3 Alternative B: Harvest, Cumulative Effects to Air Quality

Smoke resulting from the proposed project may have a cumulative effect with other prescribed burns being conducted in the region as well as with pollutants produced from other sources. Smoke produced in Montana and Idaho is regulated by the smoke monitoring unit, and its cumulative impact is considered in issuing burning restrictions. (Turah Creek EA, DNRC 2002)

It is estimated that of the slash generated from harvest operations, approximately 10-20% concentrated at landings would be burned. The burning period is estimated at 2-3 days. The 3A air shed (location of

proposed burning) is outside (and east of) the Missoula air shed and Impact Zone. The Potomac valley community immediately west of the proposed burning could be affected should an air inversion or east wind occur post ignition. This not with-standing, cumulative impacts to air quality should be relatively minor and of short duration.

4.7 Recreation

4.7.1.1 Alternative A: No Action, effects to recreation

No change would occur.

4.7.1.2 Alternative B: Action, direct, indirect and cumulative effects to Recreation

The Garnet Range road would not be used to haul forest products; therefore there would be no effect to visitors traveling to the Garnet Ghost Town. Forest products would not be hauled on any designated snowmobile routes within the Garnet Winter Recreation Area managed by the BLM. Recreational activities within the Project Area would be affected by harvest activities during the Timber Sale Contract period up to three years. Slash burning would occur one year following completion of harvest activities in the fall and burning operations could affect area users short term, 2-5 days approximately.

4.8 Economics

4.8.1.1 Alternative A: No Action, Economic effects

Under Alternative A: No Action, no harvesting would take place and no revenue would be generated with the exception of proceeds from Recreational Use Licenses and a grazing lease.

4.8.1.2 Alternative B: Harvest, Economic Effects

Approximately $350,000-$525,000 would be generated for the Common Schools Grant from the harvest and sale of the estimated 14,000-21,000 tons. Stumpage value is estimated at $175/MMBF or $25/ ton.

The amount of forest improvement collection from this sale would be $4.47 per ton or a total of approximately $62,580-$93,870. This would be applied to the sawlog volume harvested. This money would be deposited in the forest improvement fund to be used for thinning, prescribed burning, planting, weed management, etc. on Trust Lands.

If this proposed project was implemented, it would provide work for a road building contractor, a logging contractor, their subcontractors, and their employees. The forest products would most likely be processed in local mills providing further job opportunities.

4.9 Visual Quality

4.9.1.1 Alternative A: No Action, Effects to Visual Quality

Under Alternative A: No Action, no road building or harvesting would take place. There would be no immediate change to visual quality. The abrupt edges associated with the 1989 clear-cuts would not be modified. Saplings within the regenerated clear-cuts created in 1989 would continue to grow and there would be an increase in crown density. The increase of crown density would provide greater snow intercept. Currently, the difference in snow intercept between cut and un-cut areas; makes cut areas more visible from afar while there is snow on the ground. As a result, the cut areas appear light (a shade of white) and the un-cut areas appear darker in contrast when there is not snow accumulated in the crowns of trees in the un-cut areas. As the trees within the cut areas increase in size and crown density there will be a corresponding decrease in contrast between previously cut and un-cut areas. The current stocking levels within un-cut forested areas, predisposes Douglas-fir within them to Douglas-fir beetle infestation; and subsequently, the potential for increased fire intensity should one occur. Within un-cut areas individuals and groups of trees eventually would die providing gaps in the tree canopy; which would provide changes to the contrast between cut and un-cut areas. Long term changes to cut and un-cut areas would likely improve the visual quality of the Project Area when viewed from afar.

In the event of a forest fire, assessing effects with respect to visual quality would be subjective and difficult to predict with any certainty. However there is the potential for stand replacement and mixed severity fire to occur within the Project Area. Should a fire occur, there would be an active effort to suppress the fire, where by consideration of effects to visual aspects would likely take a subordinate priority. These types of changes to forest cover, particularly a stand replacing fire could have a very noticeable impact on visual quality at some point in the future. However even without some type of disturbance, such as fire, timber harvest, wind damage or insect epidemic, far view visual quality would likely improve progressively over time. Even though alterations to landscape patterns that resulted from clear-cutting in 1989 would remain, if not altered, they would be less conspicuous over time.

4.9.1.2 Alternative B: Harvest, Direct, Indirect, and Cumulative Effects to Visual Quality

Approximately 2.75 miles of new permanent roads would be constructed within the Project Area. These roads would remain in place but would be closed to all public motorized traffic.

The proposed shelterwood treatments would tend to improve visual quality. A result of reducing stocking and creating openings within proposed harvest areas, especially along the edges of 1989 clear cuts, would soften edge and decrease contrast. This would improve the scale of

cutting patterns when viewed from afar and would tend to make them appear more natural. Approximately 130 acres or approximately 38% of the harvest proposed would occur within areas classed as Lynx habitat. Within Lynx Habitat 40% crown closure would be maintained. The potential to reduce stocking and create openings within Lynx habitat would be restricted (by maintaining 40% crown closure); and as a result would decrease opportunities for improving visual quality when viewed from afar. Although subjective, retaining 40% crown cover would not diminish aesthetics when viewed from within the Project Area.

4.10 Wildlife

4.10.1 Endangered Species

4.10.1.1 Grizzly Bears

4.10.1.1.1 Alternative A: No Action, Direct and Indirect Effects to Grizzly Bears

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Within the 436 acres of mature forest on the affected parcel, approximately 181 acres showed infestation (detected aerially by exhibiting red needles) by mountain pine beetles in 2008, and an additional 48 acres displayed red needles during the 2009 aerial detection survey. With the potential for growth in the future, there would likely be temporary increases in sight distance within the affected stands until advanced regeneration could fill the forest gaps created by insect-induced tree mortality. However, because roads on the affected parcel are closed, there would likely be low risk of direct or indirect effects from the No Action Alternative.

4.10.1.1.2 Alternative A: No Action, Cumulative Effects to Grizzly Bears

Under the No Action Alternative, no trees would be harvested or roads constructed, while much of the analysis area would remain unchanged by mountain pine beetle infestation due to recent timber harvesting on current and former industrial forest grounds that comprise approximately 60% of the lands in the analysis area. Additionally, many of the closed roads within the analysis area are located on the current or former industrial forest lands. As a result, there would likely be low risk of cumulative effects to grizzly bears as a result of this alternative.

4.10.1.1.3 Alternative B: Harvest, Direct and Indirect Effects to Grizzly Bears

The proposed action would harvest timber on approximately 345 acres, and construct approximately 2.75 miles of new road. The proposed action would not construct new open roads. Total road density would increase from approximately 4.55 miles per square mile to approximately 7.30 miles of total road per square mile. Under the proposed silvicultural prescriptions, approximately 130 acres classified as Lynx habitat would be treated to retain 40% crown cover (approximately 50-80 sq. ft. of basal area per acre), while the remaining 215 acres would be treated to retain 40 to 60 sq ft of basal area per acre. As a result, some visual screening cover would be retained post-harvest. Because there would be no increase in open road densities and there would be some increases in sight distances due to the proposed timber harvest, there would likely be low risk of direct and indirect effects to grizzly bears from the proposed action.

4.10.1.1.4 Alternative B: Harvest, Cumulative Effects to Grizzly Bears

Under the proposed action, no new open roads would be created; however, total road density would increase from approximately 4.88 miles of total road per square mile to approximately 4.9 miles of total road per square mile. Given existing sight distances on former industrial forest land within the analysis area, the proposed action would result in minor increases in sight distance within the analysis area. As a result, there would likely be low risk of cumulative effects to grizzly bears from the proposed action.

4.10.1.2 Lynx

4.10.1.2.1 Alternative A: No Action, Direct and Indirect Effects to Lynx

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Within the 436 acres of mature forest on the affected parcel, approximately 181 acres showed infestation (detected aerially by exhibiting red needles) by mountain pine beetles in 2008, and an additional 48 acres displayed red needles during the 2009 aerial detection survey. Western spruce budworm has also been active on the parcel since 2008. With the potential for continued mountain pine beetle mortality in the future, there would likely be potential for development of additional mature foraging habitat stands, when advanced regeneration would fill the forest gaps created by insect-induced tree mortality. As a result, there would likely be low risk of direct or indirect effects from the No Action Alternative.

4.10.1.2.2 Alternative A: No Action, Cumulative Effects to Lynx

Under the No Action Alternative, no trees would be harvested or roads constructed, while much of the analysis area would be affected by mountain pine beetle and western spruce budworm infestations. Within the analysis area in 2009, approximately 17,377 acres (19%) were affected by only the western spruce budworm, and approximately 49,433 acres (54%) of the analysis area were affected by both western spruce budworms and mountain pine beetles (USFS 2009 Aerial Detection Survey). Thus, >50% of lynx habitat within the analysis area has the potential to be affected under the No Action Alternative by natural processes. Through these processes, existing mature foraging habitat could be compromised through the death of the lodgepole pine overstory and a compromised understory of spruce and true firs. However, such conditions may create long term potential for denning habitat through jackstrawed lodgepole pine logs (i.e., fallen snags) with dense spruce and true fir regeneration. As a result, there would likely be short term cumulative effects to lynx habitat from insect-induced mortality, with long term benefits through the creation of denning and young foraging habitat from the No Action Alternative.

4.10.1.2.3 Alternative B: Harvest, Direct and Indirect Effects to Lynx

The proposed action would commercially harvest timber on approximately 345 acres, retaining (1) $\geq$ 40% crown closure among all trees in stands currently classified as lynx habitat (approximately 130 acres); and (2) $\leq$ 10% of the stand area would be retained in subalpine fir and Engelmann spruce regeneration, where present in the affected mature foraging and "other" lynx habitat stands. As such, no currently suitable lynx habitat would be converted to temporarily unsuitable habitat post-harvest. Post-harvest, the affected lynx habitat would likely retain features that would facilitate movement and acquisition of alternative prey species by lynx. As a result, there would likely be low risk of direct or indirect effects to lynx from the proposed Action Alternative.

4.10.1.2.4 Alternative B: Harvest, Cumulative Effects to Lynx

As discussed for the No Action Alternative, Cumulative Effects, the analysis area is experiencing an outbreak of western spruce budworm and mountain pine beetles. As a result, many spruce and true fir trees of all age classes are being compromised through defoliation by budworms, while mature lodgepole pine and Ponderosa pine are being affected by mountain pine beetles. In the short term, there may be a reduction in mature foraging habitat for lynx; while long-term, the natural disturbance may create an abundance of young foraging habitat and denning habitat.

With respect to DNRC actions, this proposed action, as well as the Dry Bearmouth and Haywire Wallace timber sales, would implement project-

level mitigations to reduce potential impacts to lynx (see discussion in Direct and Indirect Effects). Such measures would include minimizing the risk of converting currently suitable lynx habitat to temporary non-lynx habitat. Thus, many of the acres currently classed as mature foraging that are proposed for timber harvesting would likely be converted to conditions typical of "other" lynx habitat. When proposed DNRC actions are put in the context of the analysis area, the scale lynx use habitat, and examined in conjunction with past actions on former private industrial timber lands, DNRC's mitigative efforts to retain affected lynx habitat in suitable conditions post-harvest would likely pose low risk of cumulative effects to lynx.

4.10.2 Sensitive Species

4.10.2.1 Flammulated Owls

4.10.2.1.1 Alternative A: No Action, Direct, Indirect and Cumulative Effects to Flammulated Owls

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Increases in snags would be expected to result over time as decay agents are introduced into the insect-induced tree mortalities. As a result, there would likely be positive direct and indirect effects to flammulated owls due to the retention of bug-killed trees and subsequent development of cavities by pileated woodpeckers and norther flickers, as well as pockets of regeneration that would eventually develop around bug-killed trees. Additionally, as a result of the insect infestation within the Project Area, there would likely be a greater proportion of snags in the future, providing better habitat conditions for this species. Therefore, there would likely be low risk of cumulative effects to flammulated owls from the No Action Alternative.

4.10.2.1.2 Alternative B: Harvest, Direct, Indirect and Cumulative Effects to Flammulated Owls

The proposed action would harvest timber in approximately 211 of the approximately 249 acres of potential suitable flammulated owl habitat. Generally, the proposed harvest would be a modified shelterwood in the affected flammulated owl habitat types, providing for future forest regeneration under the leave trees. Leave trees would be retained in groups, favoring retention of Ponderosa pine, western larch, and Douglas-fir. The pattern of residual trees and subsequent regeneration would likely be beneficial for flammulated owls because it would provide for clusters of potential snags that would eventually be encompassed by young forest with insects upon which this species could forage. As a result, there would likely be low to moderate risk of direct and indirect effects to

flammulated owls within the affected parcel from the proposed action. Additionally, where prior entries within the affected parcel regenerated the forest, but retained little overstory, the proposed action would seek to provide for both an overstory and an eventual understory in the long term, where little forest regeneration currently exists. Thus, there would likely be low risk of cumulative effects to flammulated owls from the propose action.

4.10.2.2 Pileated Woodpeckers

4.10.2.2.1 Alternative A: No Action, Direct and Indirect Effects to Pileated Woodpeckers

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Increases in snags and feeder logs would be expected to result over time as decay agents are introduced into the insect-induced tree mortalities. As a result, there would likely be positive direct and indirect effects to pileated woodpeckers due to the retention of bug-killed trees.

4.10.2.2.2 Alternative A: No Action, Cumulative Effects to Pileated Woodpeckers

Since 2008, approximately 2,084 acres (40%) of the approximately 5,214 acre analysis area has been affected by mountain pine beetles and western spruce budworm. The regions of the analysis most affected by the insects also correspond to those areas with greater canopy cover and are likely to have a higher suitability for foraging or nesting use by pileated woodpeckers. As a result of the insect infestation within the analysis area, there would likely be a greater proportion of snags and feeder logs in the future, providing better habitat conditions for this species. Therefore, there would likely be low risk of cumulative effects to pileated woodpeckers from the No Action Alternative.

4.10.2.2.3 Alternative B: Harvest, Direct and Indirect Effects to Pileated Woodpeckers

The proposed action would harvest timber in approximately 167 of the approximately 201 acres of potential pileated woodpecker habitat, retaining $\geq$40% crown closure in all tree size classes on approximately 30 acres of this habitat post-harvest. Conversely, approximately 133 acres of current potential pileated woodpecker habitat would be temporarily unsuitable for pileated woodpeckers post-harvest. As a result, there would likely be low to moderate direct and indirect effects to pileated woodpeckers within the affected parcel from the proposed action.

4.10.2.2.4 Alternative B: Harvest, Cumulative Effects to Pileated Woodpeckers

As discussed under cumulative effects for the No Action Alternative, the ongoing insect infestation may enhance pileated woodpecker habitat through creation of snags and potential feeder logs. The proposed action would harvest timber on approximately 163 acres of potential pileated woodpecker habitat, making approximately 133 acres temporarily unsuitable for this species post-harvest. Given the scale of the analysis area (5,214 acres), there would likely be a low risk of cumulative effects from the proposed action to pileated woodpeckers within the analysis area.

4.10.2.3 Fisher

4.10.2.3.1 Alternative A: No Action, Direct and Indirect Effects to Fisher

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Increases in snags and downed logs would be expected to result over time as decay agents are introduced into the insect-induced tree mortalities. As a result, there would likely be positive direct and indirect effects to fishers due to the retention of bug-killed trees.

4.10.2.3.2 Alternative A: No Action, Cumulative Effects to Fisher

Since 2008, approximately 2,084 acres (40%) of the approximately 5,214 acre analysis area has been affected by mountain pine beetles and western spruce budworm. The regions of the analysis most affected by the insects also correspond to those areas with greater canopy cover and are likely to have a higher suitability for use by fishers. As a result of the insect infestation within the analysis area, there would likely be a greater proportion of snags and downed logs in the future, providing better habitat conditions for this species. Therefore, there would likely be low risk of cumulative effects to fishers from the No Action Alternative.

4.10.2.3.3 Alternative B: Harvest, Direct and Indirect Effects to Fisher

The proposed action would harvest approximately 195 acres of the approximately 428 acres of fisher preferred habitat types within the Project Area. To mitigate the effects of the proposed harvest on fisher, the following mitigations would be implemented:

1. In accordance with ARM 36.11.440 (1)(b)(iii), large coarse woody debris would be maintained and/or recruited.

2. In accordance with ARM 36.11.440 (1)(b)(i) and (i)(A), along class 2 streams on the affected parcel, the proposed action would maintain 75% of the area within 50 ft of the stream in ≥40% crown closure.

Because the affected parcel is located adjacent to former industrial timber lands that have been treated with seed tree harvests, there would likely be a lower likelihood of fishers extensively utilizing this parcel. As a result, there would likely be a lower risk of direct and indirect effects to fishers from the proposed action.

4.10.2.3.4 Alternative B: Harvest, Cumulative Effects to Fisher

As discussed under cumulative effects for the No Action Alternative, the ongoing insect infestation may enhance fisher habitat through creation of snags and downed logs. The proposed action would harvest timber on approximately 195 acres of fisher preferred habitat types; subsequently reducing the potential suitability of those for this species post-harvest. Given the scale of the analysis area (5,214 acres), there would likely be a low risk of cumulative effects from the proposed action to fishers within the analysis area.

4.10.3 Big Game

4.10.3.1 Elk

4.10.3.1.1 Alternative A: No Action, Direct and Indirect Effects to Elk

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Within the 436 acres of mature forest on the affected parcel, approximately 181 acres showed infestation (detected aerially by exhibiting red needles) by mountain pine beetles in 2008, and an additional 48 acres displayed red needles during the 2009 aerial detection survey. With the potential for growth in the future, there would likely be temporary increases in sight distance within the affected stands until advanced regeneration could fill the forest gaps created by insect-induced tree mortality. However, because roads on the affected parcel are closed, there would likely be low risk of direct or indirect effects from the No Action Alternative.

4.10.3.1.2 Alternative A: No Action, Cumulative Effects to Elk

Under the No Action Alternative, no trees would be harvested or roads constructed, while much of the analysis area would remain unchanged by mountain pine beetle infestation due to recent timber harvesting on current and former industrial forest grounds that comprise approximately 60% of the lands in the analysis area. Additionally, many of the closed roads within the analysis area are located on the

current or former industrial forest lands. As a result, there would likely be low risk of cumulative effects to elk summer habitat as a result of this alternative.

4.10.3.1.3 Alternative B: Harvest, Direct and Indirect Effects to Elk

The proposed action would harvest timber on approximately 345 acres, and construct approximately 2.75 miles of new road, all of which would be closed to the public. Of the acres to be harvested, approximately 130 acres would retain ≥40% crown closure among all tree size classes, and the remaining 215 acres would largely be harvested as a modified shelterwood harvest. Acres to be harvested as a modified shelterwood would likely produce more forbs and more palatable forage for elk post-harvest. Because of the likely increase in higher quality forage post-harvest and no increase in open roads, there would likely be low risk of direct or indirect effects to elk summer habitat from the proposed action.

4.10.3.1.4 Alternative B: Harvest, Cumulative Effects to Elk

As discussed under Direct and Indirect effects, the proposed action would increase the amount of openings within the analysis area by approximately 215 acres through implementation of a modified shelterwood harvest. Additionally, no new open roads would be created by the proposed action. As a result of minor increases in new openings and no new open roads, the proposed action would likely have minor risk of cumulative effects to elk summer habitat.

4.10.4 Other Issues

4.10.4.1 Northern Goshawk

4.10.4.1.1 Alternative A: No Action, Direct and Indirect Effects to Northern Goshawk

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Increases in snags and feeder logs would be expected to result over time as decay agents are introduced into the insect-induced tree mortalities. As a result, there may be corresponding increases in prey species, such as pileated woodpeckers, northern flickers, and hairy woodpeckers. However, there may also be corresponding decreases in potentially suitable nesting habitat due to decreased canopy closure, and potential increases in predator species, such as the great horned owl that could capitalize on temporary decreases in canopy closure. As a result, there may be low to moderate risk of direct and indirect effects to northern goshawks from

the No Action Alternative, depending upon the ultimate extent of insect-induced mortality within the Project Area.

4.10.4.1.2 Alternative A: No Action, Cumulative Effects to Northern Goshawk

Since 2008, approximately 2,184 acres (18%) of the approximately 12,090 acre analysis area has been affected by mountain pine beetles and western spruce budworm. The regions of the analysis most affected by the insects also correspond to those areas with greater canopy cover and are likely to have a higher suitability for foraging and nesting use by goshawks. As a result of the insect infestation within the analysis area, there would likely be a greater proportion of snags and logs in the future, providing better habitat conditions for prey species, such as pileated woodpeckers, northern flickers, and hairy woodpeckers. However, there may also be corresponding decreases in potentially suitable nesting habitat due to decreased canopy closure, and potential increases in predator species, such as the great horned owl that could capitalize on temporary decreases in canopy closure. As a result, there may be low to moderate risk of cumulative effects to pileated woodpeckers from the No Action Alternative.

4.10.4.1.3 Alternative B: Harvest, Direct and Indirect Effects to Northern Goshawk

The proposed action would harvest timber in approximately 345 acres in the approximately 378 acres of potentially suitable goshawk nesting habitat within the Project Area. The proposed action would retain $\geq$ 40% canopy closure among all tree size classes on approximately 130 acres post-harvest, retain approximately 80 square feet of basal area per acre post-harvest on approximately 47 acres, and approximately 40 – 60 square feet of basal area per acre on the remaining 187 acres through a modified shelterwood prescription. As a result, much of the currently potential nesting habitat that would be treated with the modified shelterwood prescription would likely best serve goshawks as potential foraging habitat post-harvest. Because no nest was located within the Project Area, despite a systematic survey for goshawk nests in 2006, it would be difficult to ascertain how goshawks utilize the parcel. The proposed action would likely have low to moderate direct and indirect effects to nesting habitat within the Project Area because the stands that likely would be most suitable for nesting would be treated with the prescription that would retain $\geq$ 40% canopy closure post-harvest. However, potential foraging habitat on the parcel would likely have moderate direct and indirect effects due to the projected post-harvest volume to be retained (40 – 60 sq ft basal area per acre) on >50% of the acres to be treated.

4.10.4.1.4 Alternative B: Harvest, Cumulative Effects to Northern Goshawk

The proposed action would harvest timber in approximately 43% of the potential nesting habitat within analysis area. Coupled with the extent of the mountain pine beetle and spruce budworm infestation in potential goshawk nesting habitat, the proposed action may have moderate risk of cumulative effects to goshawk habitat within the analysis area.

4.10.4.2 Great Gray Owl

4.10.4.2.1 Alternative A: No Action, Direct and Indirect Effects to great gray Owl

Under the No Action Alternative, no trees would be harvested or roads constructed. However, increased mortality in lodgepole pine and Ponderosa pine would be expected due to increased infestation by mountain pine beetles. Increases in snags and feeder logs would be expected to result over time as decay agents are introduced into the insect-induced tree mortalities. As a result, there may be corresponding increases in potential natural nest sites through increases in broken top Ponderosa pine snags. However, there may also be reductions in multi-story forest due to the insect-induced mortality. As a result, there may be low risk of direct and indirect effects to great gray owls from the No Action Alternative, depending upon the ultimate extent of insect-induced mortality within the Project Area.

4.10.4.2.2 Alternative A: No Action, Cumulative Effects to Great Gray Owl

Because great gray owls oftentimes utilize old goshawk nests for nesting, the goshawk cumulative effects analysis area will be used for this species as well. As a result, the projected cumulative effects for goshawks under this alternative would be expected to be similar for great gray owls.

4.10.4.2.3 Alternative B: Harvest, Direct and Indirect Effects to Great Gray Owl

Because no goshawk nest was located within the Project Area, despite a systematic survey for goshawk nests in 2006, it would be difficult to ascertain how goshawks, or even great gray owls, utilize the parcel. The proposed action would likely have low to moderate direct and indirect effects to potential nesting habitat within the Project Area because the stands that likely would be most suitable for nesting would be treated with the prescription that would retain $\geq$ 40% canopy closure post-harvest. For the remaining stands, potential foraging habitat would likely not be increased because modified shelterwood

harvests would be employed that may not necessarily increase or improve rodent habitat within the Project Area.

4.10.4.2.4 Alternative B: Harvest, Cumulative Effects to Great Gray Owl

The proposed action would harvest timber in approximately 43% of the potential goshawk nesting habitat within analysis area. Coupled with the extent of the mountain pine beetle and spruce budworm infestation in potential goshawk nesting habitat, the proposed action may have moderate risk of cumulative effects to great gray owls due to its impacts on potential goshawk nesting habitat within the analysis area.

4.11 Cumulative Effects Associated with other DNRC Projects

Several other DNRC projects are either ongoing or have undergone scoping in the general area around the Washoe Creek Project Area. The following Table displays the name of the proposed activity, the year when activity is planned, and the type of activity proposed. Of the projects listed, all are outside of any Analysis Area used in this assessment and would have no measurable cumulative effects on wildlife considered in this assessment.

Table 4-1: OTHER DNRC MISSOULA UNIT ACTIVITIES

Project Name	Air miles from Washoe Creek	Year of Proposed Activity or Completion	Description of Proposed Activity
Turah Creek	18	2003-2005 completed	Commercial Thinning
Cramer	4	2003-2005 completed	Shelterwood
Tyler Creek	12	2004-2006 completed	Shelterwood
Davis Point	26	2005-2006 completed	Overstory removal
Dirty Ike Fire Salvage	11	2003-2004 completed	Salvage
Land of Lodgepole	4	2003-2005 completed	Commercial Thinning
St. Regis Beetle	84	2003 completed	Commercial Thinning
St. Regis Cable	82	2003 completed	Commercial Thinning
Flat Pardee	74	2003 completed	Commercial Thinning
Greenough	1	2004 completed	Commercial Thinning
Fish Creek Fire Salvage	59	2005 completed	Salvage
Deadman	32	2006 completed	Commercial Thinning
Fournier Creek Fire Salvage	38	2007 completed	Salvage
Starving Cramer Fire Salvage	10-12	2007 completed	Salvage
Roman/Six Mile	20	2009 completed	Commercial Thinning
Timber Creek	101	2009 completed	Shelterwood
Packer Fire Salvage	8	2010 completed	Salvage
Dry Gulch	7	2010 completed	Shelterwood
Gambler’s Secret	4-10	2009-2011	Shelterwood
Mill Creek	40	2009-2011	Shelerwood
Deer Creek	22	2009-2011	Shelterwood

5.0 List of Individuals Associated with the Project

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